ERICSSON

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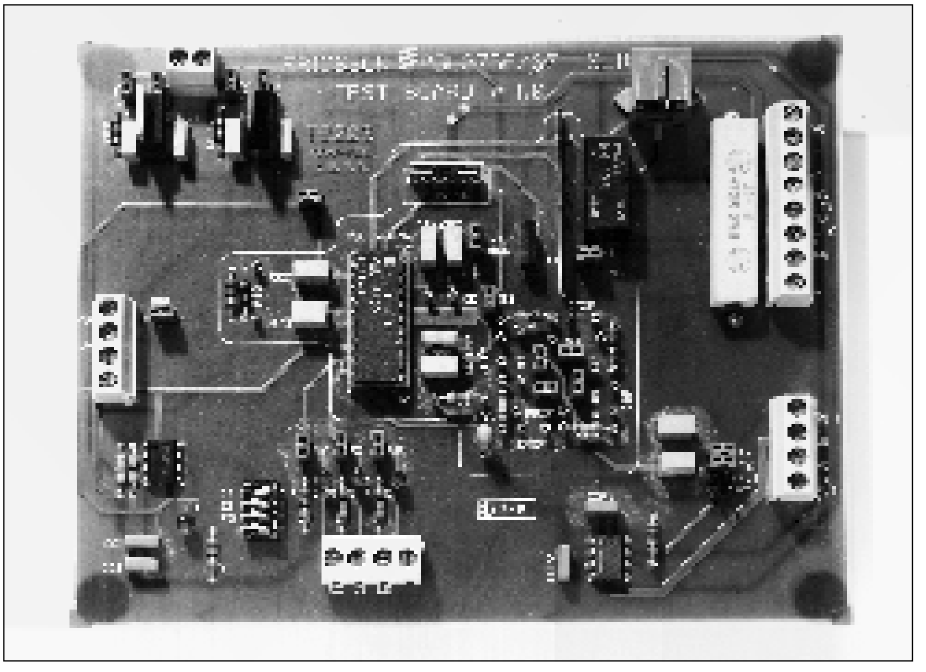
TB 203 Testboard for SLIC PBL 3766, 3767

Testboard TB 203 offers a complete Subscriber Line application, equipped with all the essential components.
This helps you in designing analogue or digital switches.
The SLIC includes all normal BORSCHT functions like two-to-four-wire, four-to-two-wire conversion, DC-feed and signalling.
Impedance levels on the testboard are designed with American µ-law PCM PABX linecard in mind. It might therefore be necessary to exchange some external components to modify performance to comply with local requirements.



Key Features

- Ready to be used upon delivery
- Only 3 voltages are necessary V_{Bat}, +12V, -12V
- TISP - transient protection
- Extensive programmability
- Small space hybrid Ring trip network
- ITU-T & FCC compatible Thick Film Line Resistor

Quick Start

Following details are needed to run the testboard:

Power supply with +12V, -12V, and -48V or -28V capable of delivering 100mA. Pulse generator with TTL output levels. Variable resistor 0 - 2 kohm. Oscilloscope, some cables and connectors.

Turn off the power supply (make this a habit when connecting and disconnecting components or power supply), minimizing the risk to damage the circuit.

Connect the variable resistor (telephone line) between the TIP and RING terminals and connect the pulse generator to the VRX terminal.

VTX terminal is direct output from the SLIC, VFLT is output with gain/ frequency network and VT is output with an external OP amp.

The testboard is configured as follows:

- 600 ohm terminating impedance
- 4-wire to 2-wire gain 0.6 dB (600 ohm load)
- 2-wire to 4-wire gain -0.6 dB
- The hybrid function is balanced for a 600 ohm load
- Loop current threshold = 8 mA

Connecting Terminals

Power Supply

+12V	Positive power supply
-12V	Negative power supply
VBAT	Battery voltage
GND	Ground reference

Input Signals

VRX	Analog input signal from CODEC/ filter
RING1	Ring signal with ring generator protection
RING2	Ring signal without protection
DT	Positive input to ring trip comparator
C1, C2	Decoder inputs controlling the SLIC operating modes and states, TTL compatible.
E0	Enables the detector output DET.

Output Signals

VTX	DC coupled, analog output directly from SLIC 4-wire output. Can be connected directly to SICOFI or SLAC.
VFLT	Analog output from trans-hybrid network. Can be connected to the input stage of a CODEC device.
VT	Analog output from OP-amp on the testboard. This OP-amp can be used as a replacement for the input stage of a CODEC device.
TIP	Two-wire output, A-wire.
RING	Two-wire output, B-wire.
EXT.RING	Output of external ring trip network.
DET	Loop and ring trip detector output. Active low.

Functional Description

The major building blocks are the SLIC, the overvoltage protection, the ringing and the transhybrid function.

These components, necessary for the Subscriber Line Interface are placed inside the thin line (dotted on the circuit diagram) on the PCB. The other components, outside the thin line, are only used for evaluation purposes.

SLIC

This block contains all the components that are normally associated with a SLIC design, like for example the battery feed, detector thresholds and gain. Please refer to the section ”Design Information” below for more information regarding how to select correct component values for the application.

Overvoltage Protection for 2-Wire Interface

The protection consists of an Ericsson line resistor PBR 5111/1 or PBR 5111/2 with the resistance 2•20 Ω designed to meet ITU-T rec. K20 requirements.

A fuse function is trigged when the 2-wire is connected to high non-transient voltages, like power cross condition.

If the fuses blow, the thick film printing and the substrate will crack, without generating smoke or fire, that could damage the Line Card.

The TISP (Transient Protection circuit) is placed after the resistor network and clamps all positive voltages to +3V and all negative voltages to -68V, thus protecting the SLIC from damage.

Ring-Trip Network

The internal network is designed for unbalanced ring injection that is normally superimposed on the battery voltage.

The ring trip network, PBA 3310 from Ericsson Components AB, is a two-stage filter network on a small hybrid substrate. The network connects directly to the Ring Relay and SLIC DT comparator input.

The network, PBA 3310, is designed to operate with up to 5 telephones in parallel, and with maximum ringing voltage of 110 V_{RMS} superimposed on the battery voltage.

The detector output will not be stable for all sorts of combi-nations and bell types. In special cases it is possible to make detection by evaluating the duty cycle of the detector output.

If the ring signal is applied at RING1 then RING GEN. PROT. is included as protection for the ring generator, which may be damaged if ringing is made on a short circuited 2-wire.

At RING2 you bypass the protection.

The ring trip network can be realized in several ways. In case you need a special solution we can provide design help.

Power Supply

Regulators for +5 V and -5 V are provided to guarantee that the supply voltages are within tolerance range.

All the supply voltages that feed the SLIC have blocking diodes, to protect against reverse polarity. To ease current measurement in the system jumpers are provided in the appropriate leads.

Digital I/O

Switch 1 - 3 are used for setting up the SLIC control word (C1, C2 and E0).

Jumpers allow the switches to be disconnected from the SLIC inputs when the SLIC is controlled from outside of the test board.

LED’s indicate logic level HIGH when lit.

C2	C1	Status
0	0	Open circuit
0	1	Ringing state
1	0	Active state
1	1	Stand-by state

Table 1. Control inputs

The DET output is connected to a collector with internal pull-up resistor (approx. 15 kΩ) to VCC.

4-Wire Interface

The OP-amp is included to demonstrate the 2-wire to 4-wire conversion as well as to buffer the VTX output (possible to drive a 600 Ω terminated instrument directly), hereby allowing the SLIC evaluation board to be directly interfaced to a CODEC/filter.

2-Wire Interface

The TIPX and RINGX terminals have, beside the screw connection terminal, a modular type connector, to allow easy connection of a standard US telephone set.

Design Information

Battery Feed

PBL 3766 has programmable constant current feed. PBL 3767 has programmable, resistive battery feed with short loop current limiting.

The Test Board is connected to comply with system requirement of -48V battery voltage, 2•400 Ω resistive feed. ”Battery Feed” characteristic is set by R_{DC}.

Loop Current Detection Threshold

The threshold is pre-set to I_{Loop} = 8 mA, by an internal resistor. A filter capacitor, C_D, may be used to filter the detector output.

Saturation Guard Reference Voltage

To avoid saturating the SLIC at ”long” lines the internal saturation guard voltage is set to 35.2 V.
The reference voltage is set by R_{SG}.

Terminating Impedance, Z_T

The ”Terminating Impedance” is the AC-impedance that the SLIC generates to the subscriber line. It can be real or complex , $Z_T = R_T + R_{TP}//C_{TP}$. The SLIC terminating impedance is in this case set to 600 Ω. A jumper is used to bypass $R_{TP}//C_{TP}$.

The line protection resistors should be included when calculating the resistive part of the impedance. With R_F = 20 Ω the SLIC itself should generate an impedance of 560 Ω.

4-Wire to 2-Wire Gain, Z_{RX}

The receive signal is inserted at the V_{RX} terminal and the level is set by the $Z_{RX} = R_{RX} + R_{RXP}//C_{RXP}$. Positions C_{RXP} and R_{RXP} can be used for frequency versus gain adjustment. They are here bypassed by a jumper. Nominal gain is set to 0 dB. Equations will be found in the data sheet.

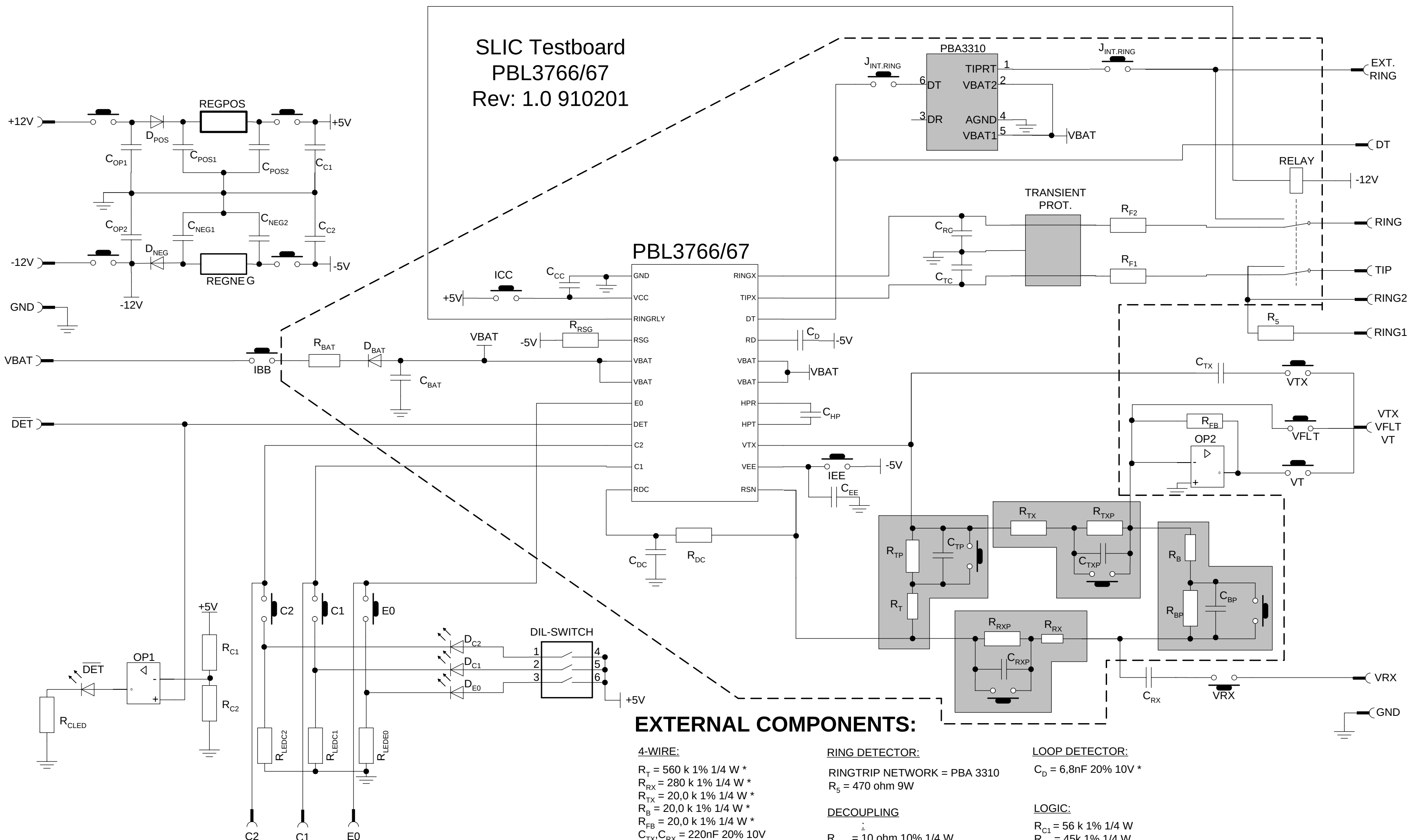
2-Wire to 4-Wire Gain, Z_{TX}

The gain is set by equation

$$\frac{Z_{T/1000}}{Z_{T/1000} + R_F \cdot 2}$$

Trans-Hybrid Balance, Z_B

The Trans-Hybrid network $Z_B = R_B + R_{BP}//C_{BP}$, is used to separate the subscriber voice signal from the 4-wire input signal (2-wire to 4-wire conversion). The remaining output signal is then connected to a CODEC/filter combination.In this case an ordinary OP-amp is used as a replacement for the input stage of a CODEC device.
Note: If a signal processing CODEC like SICOFI or SLAC is used, both Z_{TX} and Z_B networks are omitted.
In case of having any technical questions regarding the design with PBL 3766/67, please do not hesitate to contact one of our Telecom Application Engineers.



EXTERNAL COMPONENTS:

4-WIRE:

R_T = 560 k 1% 1/4 W *
R_{RX} = 280 k 1% 1/4 W *
R_{TX} = 20,0 k 1% 1/4 W *
R_B = 20,0 k 1% 1/4 W *
R_{FB} = 20,0 k 1% 1/4 W *
C_{TX},C_{RX} = 220nF 20% 10V
OP2 = LM627

2-WIRE:

R_{F1},R_{F2} = 20 ohm, PBR 5111/2
C_{HP} = ** 20% 63V *
C_{TC},C_{RC} =2,2nF 10% 63V
TRANSIENT PROT. = TISP
RELAY = OMRON G2VN,12V

RING DETECTOR:

RINGTRIP NETWORK = PBA 3310
R_5 = 470 ohm 9W

DECOUPLING

R_{BAT} = 10 ohm 10% 1/4 W
C_{BAT} = 470nF 20% 63V
C_{CC},C_{EE} = 220nF 20% 10V
C_{OP1},C_{OP2},C_{C1},C_{C2} = 47nF 20% 20V
C_{POS1},C_{NEG1} = 330 nF 20% 20V
C_{POS2},C_{NEG2} = 100nF 20% 10V
D_{BAT},D_{POS},D_{NEG} = 1N4002
REGPOS = LM7805
REGNEG = LM7905

LOOP DETECTOR:

C_D = 6,8nF 20% 10V *

LOGIC:

R_{C1} = 56 k 1% 1/4 W
R_{C2} = 45k 1% 1/4 W
R_{CLED},R_{LED1-3} = 620 ohm 1% 1/4 W
OP1 = LM741

BATTERY FEED:

R_{DC} = ** 5% 1/4 W *
C_{DC} = ** 20% 10V *
R_{SG} = OPTIONAL *

* = QUICK CHANGE
** = SLIC DEPENDENT, CHEK DATASHEET.

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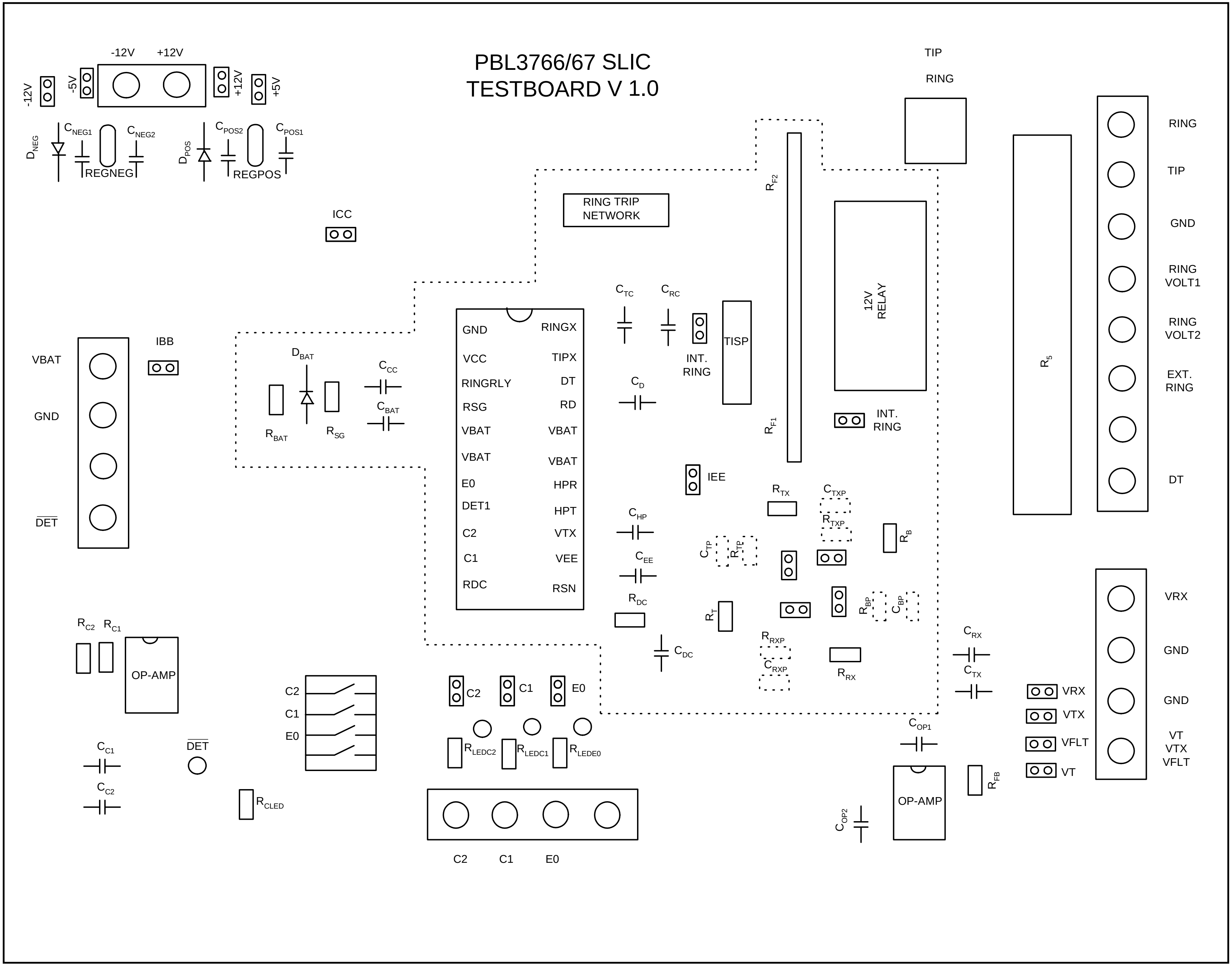
PBL3766/67 SLIC
TESTBOARD V 1.0
-12V
+12V
-12V
-5V
+12V
+5V
CNEG1
CNEG2
DNEG
REGNEG
CPOS2
CPOS1
DPOS
REGPOS
ICC
RING TRIP
NETWORK
TIP
RING
RF2
12V
RELAY
R5
RING
TIP
GND
RING
VOLT1
RING
VOLT2
EXT.
RING
DT
VBAT
GND
DET
IBB
DBAT
CCC
CBAT
RBAT
RSG
GND
VCC
RINGRLY
RSG
VBAT
VBAT
E0
DET1
C2
C1
RDC
RINGX
TIPX
DT
RD
VBAT
VBAT
HPR
HPT
VTX
VEE
RSN
CTC
CRC
INT.
RING
TISP
CD
RF1
INT.
RING
IEE
RTX
CTXP
RTXP
RB
CHP
CTP
RTP
CEE
RDC
RT
RBP
CBP
CDC
RXP
CRXP
RRX
CRX
CTX
VRX
GND
GND
VT
VTX
VFLT
VRX
VTX
VFLT
VT
RC2
RC1
OP-AMP
C2
C1
E0
C2
C1
E0
RLEDC2
RLEDC1
RLEDE0
CC1
CC2
DET
RCLED
C2
C1
E0
COP1
COP2
OP-AMP
RFB

Specifications subject to change
without notice.
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