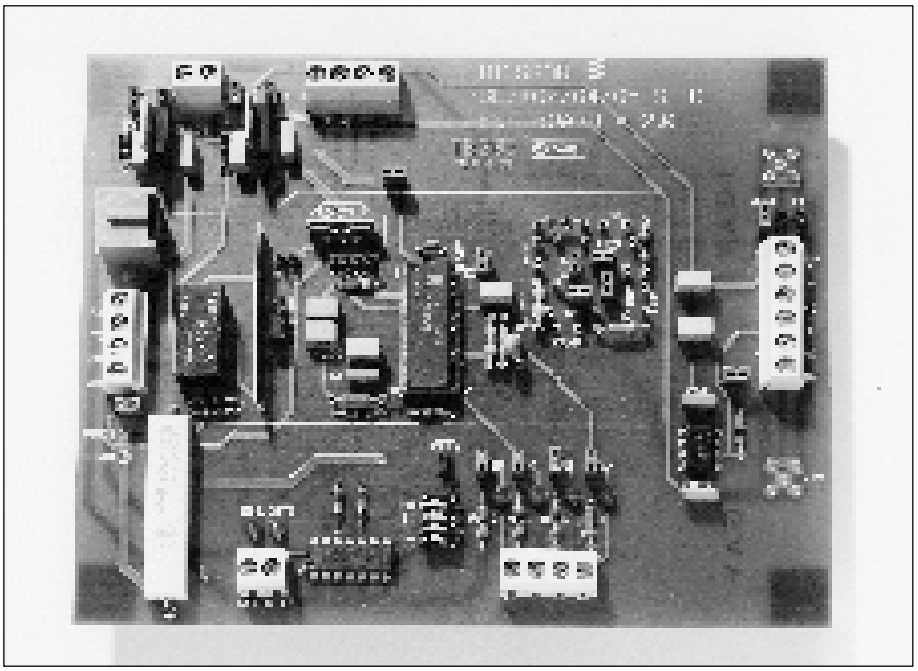
TB 205
Testboard for SLIC
PBL 3762 A/X, 3764A/X

Testboard TB 205 offers a complete Subscriber Line application, equipped with all the essential components, to get an easy access to analogue or digital line card design.
The SLIC includes all standard 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 may therefore be necessary to exchange some external components to modify performance in order to comply with local requirements.



Key Features

- Ready to use upon delivery
- Only 3 voltages necessary V_{Bat}, +12 V, -12V, for operation
- TISP - transient protection
- Extensive programmability
- Small space hybrid Ring trip network
- ITU-T & FCC compatible Thick Film Line Resistors
- ITU-T & FCC low cost SLIC

Quick Start

The following is needed to run the testboard:

Power supply with +12V, -12V, and -48V or -28V capable of delivering 100mA. One pulse generator with TTL output levels. One variable resistor 0 - 2 kohm. An oscilloscope and some cables and connectors. Turn off the power supply (make this a habit when connecting and disconnecting components or power), minimizing the risk to damage the circuit. Connect the variable resistor (telephone line) between the TIPX and RINGX terminals and connect the pulse generator to the VRX terminal. Terminal VTX 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 = 9 mA

Connecting Terminals

Power Supply

+12V	Positive power supply
- 12V	Negative power supply
V_{Bat}	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
DR	Positive input to ring trip comparator
DT	Negative input to ring trip comparator.
C1, C2	Decoder inputs controlling the SLIC operating modes and states, TTL compatible.
E0, E1	Enables the detector outputs DET1 and DET2.

Output Signals

VTX	Analog output, DC-coupled, 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.
TIPX	Two-wire output, A-wire.
RINGX	Two-wire output, B-wire.
EXT.RING	Output of external ring trip network.
DET1	Loop current, ring trip and groundkey detector output.

Functional Description

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

These components and the ones used for the Subscriber Line Interface function are placed inside the thin line (dotted on the circuit diagram) on the PCB. The other components are just for evaluating the circuit.

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 Ring Relay and SLIC DR & DT comparator inputs.

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 battery voltage. The detector output will not be stable for all sorts of combinations 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 measure in the system jumpers are provided in the appropriate leads.

Digital I/O

Switch 1 - 4 are used for setting up the SLIC control word (C1, C2, E0 and E1). 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 an inverted buffer/driver with open collector, indicating status of the DET output.

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 3762A emulates a resistive battery feed characteristic with a loop current limitation for short lines. PBL 3764 emulates a constant current battery feed characteristic.

The testboard is connected to comply with all requirements of battery voltage, within the limits of the circuit. Please check the specific datasheet to get needed battery feed characteristic.

"Battery Feed" characteristics is set by R_{DC1} and R_{DC2}.

Loop Current Detection Threshold

The threshold is set by the R_D resistor, nominally I_{loop} = 9 mA.

Saturation Guard Reference Voltage

To avoid saturating the SLIC at "long" lines the internal Saturation Guard Voltage is set to 38 - 40V depending on the circuit and battery voltage. 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 600Ω , a jumper is used to by-pass $R_{TP}//C_{TP}$. The lineprotection resistors should be included when calculating the resistive part of the impedance. With R_F = 20Ω 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 and are here bypassed by a jumper.Equations will be found in the data sheet.

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

The gain is set by equation $(Z_T/1000)/(Z_T/1000 + R_F*2)$.

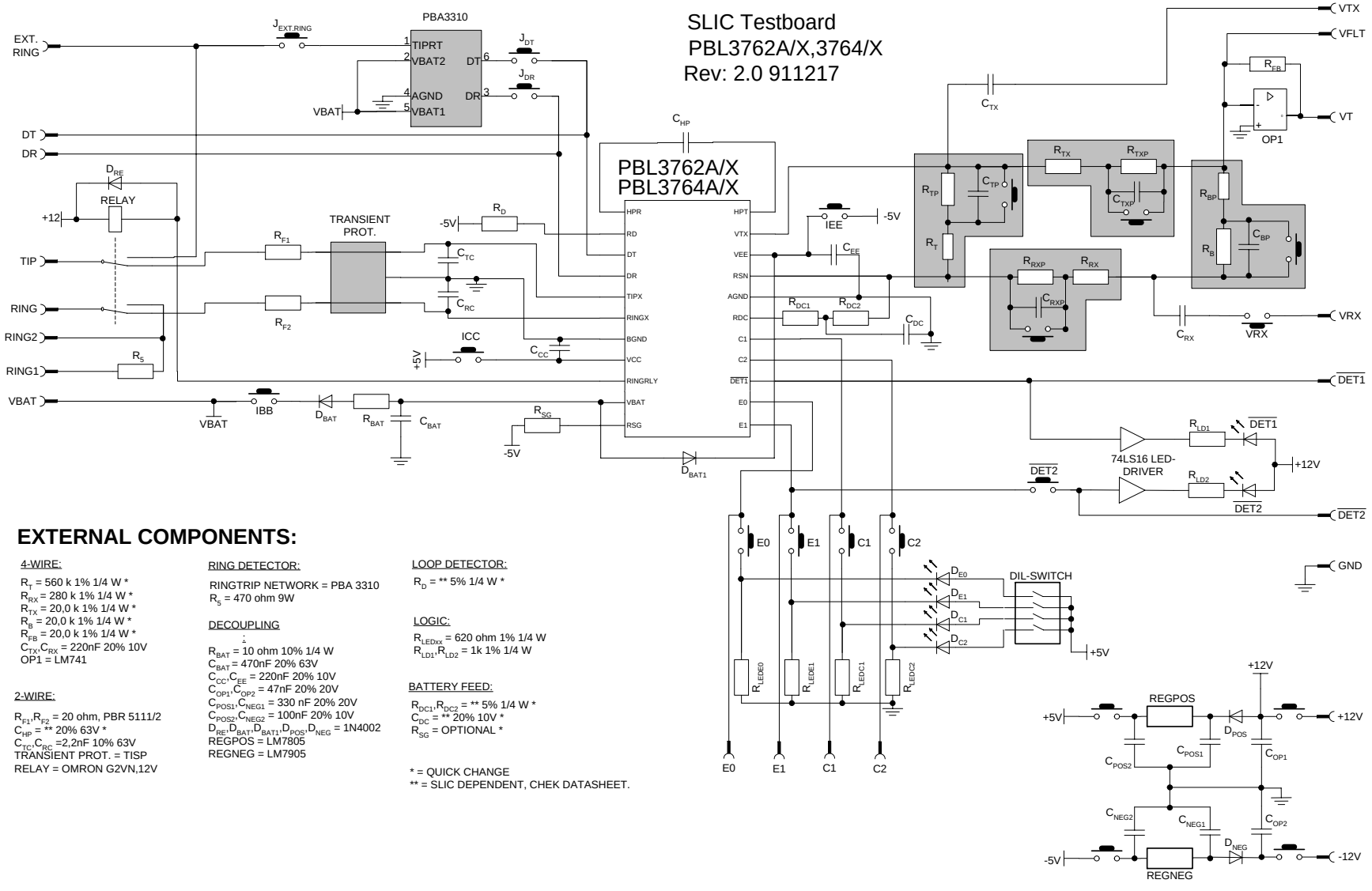
Trans-Hybrid Balance, Z_B

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 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 3762A/X or 3764A/X, 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
OP1 = LM741

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_S = 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} = 47nF 20% 20V
C_{POS1},C_{NEG1} = 330 nF 20% 20V
C_{POS2},C_{NEG2} = 100nF 20% 10V
D_{RE},D_{BAT},D_{BAT1},D_{POS},D_{NEG} = 1N4002
REGPOS = LM7805
REGNEG = LM7905

LOOP DETECTOR:

R_D = ** 5% 1/4 W *

LOGIC:

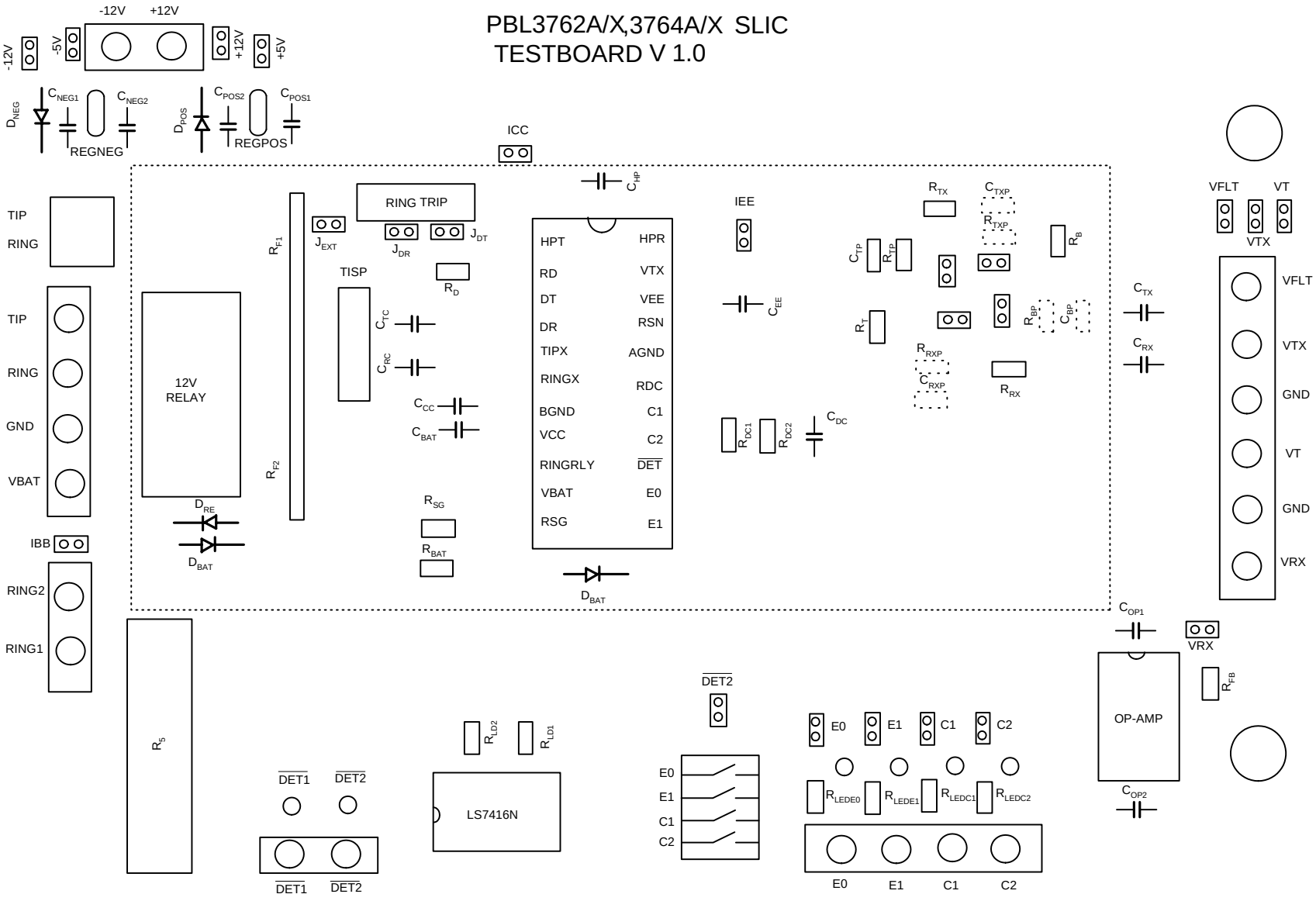
R_{LEDxx} = 620 ohm 1% 1/4 W
R_{LD1},R_{LD2} = 1k 1% 1/4 W

BATTERY FEED:

R_{DC1},R_{DC2} = ** 5% 1/4 W *
C_{DC} = ** 20% 10V *
R_{SG} = OPTIONAL *

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

PBL3762A/X,3764A/X SLIC TESTBOARD V 1.0



ERICSSON

Specifications subject to change
without notice.
LZT-15322 TB 205 Uen Rev. A

Ericsson Components AB
S-164 81 KISTA-Stockholm, Sweden
Telephone: (08) 757 50 00