

In addition to supplying dedicated customer circuits in various bipolar and MOS technologies, TELEFUNKEN electronics offers the possibility of designing customer-specific circuits with transistor arrays and standard cells. This is a favorable solution, from the point of view of costs and development duration, for rationalization plans, small series and prototypes.

Series A transistor arrays

Important characteristics

- 3 sizes (B 250 A, B 500 A, B 1000 A)
- Identical components in all arrays
- Bipolar transistors (NPN und PNP types)
- Transit frequency of the NPN types 500 MHz
- Zener diodes (6.1 V)

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- Nitride capacitors up to 16 pF
- Resistors (10 Ω to 52 k Ω)
- 32 to 57 pads
- Single-layer wiring as standard
- Two-layer wiring if required
- Used for partially customer-specific analog circuits

Description

The series A transistor arrays are high-quality, bipolar integrated circuits for a wide range of applications. They contain a series of prefabricated transistors, zener diodes, resistors, and capacitors. These components can be connected via the printed wiring layer to form customer-specific analog circuits. A cell library of the most frequently used basic circuits is available in order to simplify design work. Furthermore, simulation with the network analysis program SPICE is possible. The advantages of these arrays over dedicated customer ICs are a higher degree of flexibility if modifications are desired, lower development costs and faster production of samples, production of even very small quantities.

Cellular structure of the arrays

The components are grouped in the form of identical cells. In the center, there is a row of cells for provision of reference voltages and currents. The power transistors and the transistors for the low-noise circuits are arranged around the edge. Between the cells, there are channels for wiring of the cells and tunnels for wire crossing points. The pads around the edge of the chip are used for connection to the case terminals.

Cell library

In order to simplify design of a customer circuit, a cell library which contains the most important basic circuits has been created. For each library element, there is a data sheet with circuit diagram, layout, and electrical specifications.

The following circuits are available:

- Operational amplifiers
- Comparators
- Schmitt triggers
- Operational transconductance amplifiers (OTA)
- Oscillators
- Timer
- Mixers

It is possible to create a complete customer-specific circuit from library elements. Any necessary modifications are easily carried out. For breadboard circuits, there are so-called kit modules in DIL enclosures which contain the basic circuits of the library or single transistors.

Layout development

After development of the circuit, the necessary array is selected. Each component used in the circuit must exist on the array. As a rule of thumb, it can be expected that approx. 80% of the components existing on the selected array are very easy to interconnect. The layout construction is also simplified by the cellular structure, as the layout of identical circuit groups needs to be designed only once. Furthermore, all facilities for interconnection of the components already exist.

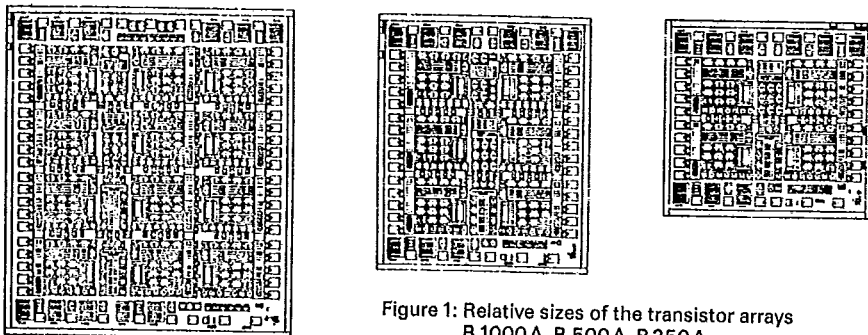


Figure 1: Relative sizes of the transistor arrays
B 1000A, B 500A, B 250A

Bipolar standard cell library**TELEFUNKEN ELECTRONIC****Important features**

- Analog functions: amplifiers, comparators, reference sources
- Bipolar standard process
- Amplifier bandwidths up to 20 MHz
- Supply voltages up to 24 V
- Various enclosure types available

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Description

The standard cell library contains a series of basic circuits which are used frequently and variously as components of customer-specific integrated circuits. It permits rapid and low-cost design. Analog and digital circuits can be integrated on one chip. Many breadboard circuits can be converted directly into integrated components. Existing cells can, in most cases, be modified easily in order to optimize their characteristics for a specific application. New cells are added continuously to the library.

Manufacturing process

A standard bipolar technology is used for manufacture of the wafers. A deep collector terminal diffusion can be added. A diffused layer and an implanted layer can be used for creation of resistors. The transit frequency of the NPN transistors is 500 MHz, while the PNP types reach a limit of 5 MHz. Capacitors are formed with the aid of a nitride layer as a dielectric. Generally, two-layer wiring is used.

Circuit development

The development of a customer-specific circuit is based on the existing cells. If necessary, integrated individual components can be added. Customer-specific cells can be designed and simulated with the network analysis program SPICE. A breadboard circuit can be created for testing of the finished design.

Layout

The layouts of the cells are optimized with respect to the chip area. All common variations can be implemented easily and rapidly. The selected format is a rectangle with a fixed edge length of 0.7 mm. The positions of the terminals are also fixed in a layout which is most favorable for interconnection of the cells.

Development scheme for custom specific analog circuits