SEMICUSTOM

Application Specific Integrated Circuits (ASICs)

In Brief . . .

Macrocell Arrays . . . Standard Cells . . .

Twin Offerings To Help You Customize Your Products — Cost-Effectively

Even as the demand for Standard (discrete) Logic forms continues to increase, the era of custom and semi-custom VLSI circuit implementation has arrived. Brought into focus by the economies of computer-aided design and manufacturing (CAD/CAM), Application-Specific Integrated Circuits (ASICs) have become cost effective even in applications with moderate volume requirements. The twin thrust of Gate (Macrocell) Arrays and Standard Cell technology has reduced both the time penalty and the cost premium for customized VLSI circuit implementation to virtually zero.

Motorola is in the forefront of this rapidly expanding field. Based on advanced processing competence developed for a broad line of standard products, both bipolar and MOS, it offers an extensive library of logic cells, a proven in-place CAD/CAM capability, and a customer training and assistance program that will turn even a first-time effort into a first-time success.

THE ASIC PHILOSOPHY

"We're supplying a foundation that allows our customers to produce an end product which comes out competitive and *stays that way* through several generations. We get the design cycle working for them, so their products don't fizzle as soon as newer parts come out. It's the difference between a product that performs on paper and one that performs in the marketplace."

Microcomputer Components

In Brief . . .

Chips and board-level products constitute a natural progression of microcomputer building blocks that the semiconductor manufacturer offers the equipment manufacturer. Each provides a different level of integration from which to begin system implementation.

Chips, of course, are the most cost effective, and offer the greatest latitude for system optimization. But they also demand the most intensive engineering effort and the longest design time. Board-level products require some sacrifice in ultimate design efficiency and in the area of contributed value. But they provide the significant compensating benefits of relatively simple implementation of the end product, quick entry into the marketplace and minimal investment in engineering effort. In each of these product categories, Motorola is an internationally recognized frontrunner in technology, product reliability and manufacturing capability.

To augment utilization of its products, Motorola supplies development instrumentation ranging from relatively simple evaluation modules to highly sophisticated MPU emulators, development systems and diagnostic instruments that support the entire spectrum of related products . . . support that is supplemented by a well-trained team of specialists to assist in solving customer design-in problems.

Standard Logic Families

In Brief . . .

Since the inception of IC technology, Motorola has earned a reputation as the supermarket for digital logic circuits. Although early circuit designs such as RTL, DTL, HTL, etc., have been largely supplanted by newer techniques, Motorola's reputation as a leading-edge supplier of standard logic families remains unchallenged.

Motorola currently concentrates on supplying those logic families and functions that advance the state of the art as well as serving the needs of designers requiring interface circuits for more complex ICs and semi-custom designs. It does so with three technologies:

ECL (four unique families), for highest speed

TTL (two families), for high performance at lowest cost

CMOS (three families), for lowest power dissipation.

In each category, the selection of available functions permits cost-effective designs with the smallest number of individual packages.

Linear and Interface Integrated Circuits

In Brief . . .

Motorola linear and interface integrated circuits cover a much broader range of products than the traditional "op amps, regulators and consumer-image" associated with linear suppliers. Linear circuit technology currently influences the design and architecture of equipment for all major markets. As with other integrated circuit technologies, linear circuit design techniques and processes have been continually refined and updated to meet the needs of these diversified markets.

Operational amplifiers have utilized JFET inputs for improved performance, plus innovative design and trimming concepts have evolved for improved high performance and precision characteristics. In linear power IC's, basic voltage regulators have been refined to include higher current levels and more precise three-terminal fixed and adjustable voltages. The power area continues to expand into switching regulators, power supply control and supervisory circuits, and motor controllers.

Linear designs also offer a wide array of line drivers, receivers and transceivers for many of the EIA, European, IEEE and IBM interface standards. Peripheral drivers for a variety of devices are also offered. In addition to these key interface functions, a variety of magnetic and semiconductor memory read, write, sense and RAM control circuits are also available.

In data conversion, the original A-D and D-A converters have been augmented with high performance video speed and multiplying designs. Linear circuit technology has also provided precision low-voltage references for use in data conversion and other low temperature drift applications.

A host of special purpose linear devices have also been developed. These circuits find applications in telecom, radio, television, automotive, RF communications, and data transmission. These products have reduced the cost of RF communications, and have provided capabilities in telecommunications which make the telephone line convenient for both voice and data communications. Linear developments have also reduced the many discrete components formerly required for consumer functions to a few IC packages, and have made significant contributions to the rapidly growing market for electronics in automotive applications.

The table of contents provides a perspective of the many markets served by linear/interface IC's and of Motorola's involvement in these areas.

Discrete Products

In Brief . . .

With the advent of integrated circuits, many leading semiconductor manufacturers have de-emphasized or eliminated discrete components from their product portfolio. Not so Motorola.

Here, continuing major investments in research and development for discrete product categories underscore a commitment to remain the world leader in both scope and breadth of these product lines.

But things are changing . . . significantly . . . and the changes are not limited simply to the expansion of product lines through enhancement of specification limits. For example:

The power transistor category, which had been dominated by bipolar technology, is now getting major competition from expanding MOS products. Already the voltage and current range of bipolar power is challenged by Motorola TMOS products and TMOS prices have reached parity with bipolar prices. With the design advantages attributed to MOS characteristics in numerous applications, an important new design alternative has become available.

Size reduction continues to be an important factor in system design — a consideration that has propelled surface-mount packaging into the limelight of semiconductor device change. And new ideas, such as combining mounting hardware with semiconductor packaging (as in Motorola Fiber Optics components) are beginning to emerge.

But most important, perhaps, is the changing nature of the entire concept of discrete componentry. With integrated circuit technology heading toward ever larger and more complex chips, discrete product designers are rapidly filling the gap for small-scale integration — but in categories that add new design freedoms. One such category is Smartpower which unites logic capability with output drive power on a single chip. Another is in RF technology where discrete product engineers are generating hybrid modules for CATV and general amplifier applications.

Thus, the field of "discrete products" is changing, both in definition and in perspective, toward a "multifunction" capability, and Motorola will continue to be the one-stop shopping center for your combined IC/discrete semiconductor requirements.

MIL-Qualified Semiconductor Products

In Brief . . .

Motorola's Military Products Operation (MPO) produces and markets bipolar and MOS integrated circuits that perform both digital and analog functions, as well as a wide range of discrete components for standard military applications. The focus is primarily on high volume commodity devices which utilize proven standard technologies to provide low manufacturing costs, and on high-growth-potential products utilizing new technologies to gain a technological leadership position.

The MPO IC market scope is the OEM military end-use market, direct and through distribution, with emphasis on Data Processing, Communications, Radar Electronic Warfare and Guidance segments. Its charter is to provide a broad and balanced portfolio of defect-free, low-cost products to MIL-M-38510 and MIL-STD-883C specifications, delivered on time, with superior service to the customer.

In discrete products, Motorola's inventory covers a broad range of 1N— and 2N— products tested to JAN, JTX, JTXV and JAN S specifications.

The Military Products Operation, a segment of Motorola's Semiconductor Products Sector, is an operation which is totally dedicated to the manufacture and supply of standard military products, with its own engineering, manufacturing and administrative resources. Products are manufactured, screened and tested world wide, on lines certified per the requirements of the pertinent military specifications.

INTEGRATED CIRCUITS:

DISCRETE COMPONENTS: