FOREWORD

The International Technology Roadmap for Semiconductors (ITRS) is the result of a worldwide consensus building process. This document predicts the main trends in the semiconductor industry spanning across 15 years into the future. The participation of experts from Europe, Japan, Korea, and Taiwan as well as the U.S.A. ensures that the *ITRS* is a valid source of guidance for the semiconductor industry as we strive to extend the historical advancement of semiconductor technology and the worldwide integrated circuit (IC) market. These five regions jointly sponsor the *ITRS*.

The Semiconductor Industry Association (SIA) coordinated the first efforts of producing what was originally *The National Technology Roadmap for Semiconductors* (*NTRS*). The *NTRS* provided a 15-year outlook on the major trends of the semiconductor industry. As such, it was a good reference document for all semiconductor manufacturers. Most of all, the *NTRS* documents provided useful guidance for suppliers of equipment, materials, and software and clear targets for researchers in the outer years.

The semiconductor industry became a global industry in the 1990s, as many semiconductor chip manufacturers established manufacturing or assembly facilities in multiple regions of the world. Similarly, the suppliers to the semiconductor industry have established worldwide operations. Furthermore, alliances, joint ventures, and many forms of cooperation have been established among semiconductor manufacturers as well as among equipment, materials, and software suppliers.

The above considerations led to the realization that a Roadmap that provides guidance for the whole industry would benefit from inputs from all regions of the world that have leadership activities in the field of semiconductors. This realization has led to the creation of the *International Technology Roadmap for Semiconductors* (*ITRS*). The invitation to cooperate on the *ITRS* was extended by the SIA at the World Semiconductor Council in April of 1998 to Europe, Japan, Korea, and Taiwan. The initial collaboration of these five regions produced the *ITRS 1998 Update*, which consisted of a comprehensive revision of the *1997 NTRS* technology requirements tables. Subsequently, the five regions jointly produced *The International Technology Roadmap for Semiconductors, 1999 Edition* and jointly sponsored *The International Technology Roadmap for Semiconductor, 2000 Update*.

The most recent full revision occurred in 2001. The *2001 ITRS* presented the latest prediction of the industry needs and potential solutions through 2016. Additionally, it also began to address the limits of traditional scaling, the opportunity for "equivalent scaling" [the extension of the device scaling approach by improving electrical performance with new or improved materials], the challenges of the industry to maintain historical trends in productivity, and the introduction of the investigation and feasibility of new device candidates within the timeframe of the Roadmap (2013-2016).

In 2002, the *ITRS* international technology working groups (TWGs) reviewed the tables of the *2001 ITRS* edition. The resulting update and clarification produced the *2002 ITRS Update*. Over 100 tables are revised. Table line items are corrected to correlate with other TWG chapters. Several tables now contain new line items or indicate a change in the difficulty of achieving a particular requirement by indicating a color change in the cell.

For the first time, the *ITRS* does not predict a further acceleration in the timing of introduction of new technologies as the industry struggles through the worst recession of its history. The *2002 ITRS Update* table headers and *Overall Roadmap Technology Characteristics* (*ORTC*) tables 1a–1j remain unchanged with the original timing as announced in the *2001 ITRS*. However, once recovery is fully underway, the progress made by companies during these trying times will be realized. The *2003 ITRS* effort, which will be a complete review and rewrite, will indicate whether this pace is a new trend or just a moment of reflection within the industry during the phase of early recovery.

It is the purpose of the *ITRS* documents to provide a reference of requirements, potential solutions, and their timing for the semiconductor industry. This objective has been accomplished by providing a forum for international discussion, cooperation, and agreement among the leading semiconductor manufacturers and the leading suppliers of equipment, materials, and software, as well as researchers from university, consortia, and government labs.

In the last few years, the *ITRS* documents have become a truly common reference for the entire semiconductor industry. Indeed, the cooperative efforts of the *ITRS* participants have fostered cooperation among international consortia, universities, and research institutions around the world. It is hoped that the *2002 ITRS Update* will further contribute to stimulate cooperative R&D investments so that the financial burden can be more uniformly shared by the whole industry. It is also hoped that the *2002 ITRS Update* will continue to stimulate the fundamental elements that encourage innovation in individual companies.