Application Note
SEMI F47

EA Elektro-Automatik

Introduction

Semiconductors are an important and indispensable part of our society. Traditionally, semiconductors are thought of being part of complex machines such as airplanes, cars or production machines. However, they are part of every electronic device used in our daily lives like smartphones, notebooks, and household items such as vacuum cleaners or dishwashers.

Semiconductor industry is a generic term and characterizes a specialized area of the electrical industry. Typical semiconductor products are for example discrete components like diodes, transistors or thyristors and complex components such as ICs or semiconductor memories. The semiconductor industry includes manufacturers of such products, as well as suppliers or manufacturers of corresponding production systems.

Due to the constant demand for technological innovations and digitalization, the market for semiconductors is expected to continuoues growth.


Modern life is no longer conceivable without semiconductors.

Semiconductor production process

Semiconductors are manufactured in a multi-stage process. First, the mined raw material, quartz sand, is processed to achieve a high level of silicon purity. In thermal processes, the silicon is formed into an ingot of pure silicon, which is then cut into small slices and silicon wafers. This is the basic product used to produce the various semiconductor components.

In the subsequent process steps, the wafers are processed into finished semiconductor components. Various sensitive process steps are necessary here, such as the application of a thin photoresist layer, the incorporation of structures with the use of UV light or the removal of material using etching processes. Semiconductors are manufactured in µm or even in nm technology. Due to these small dimensions, maximum precision is required and inaccuracies lead to expensive rejects in production and thus to high costs.
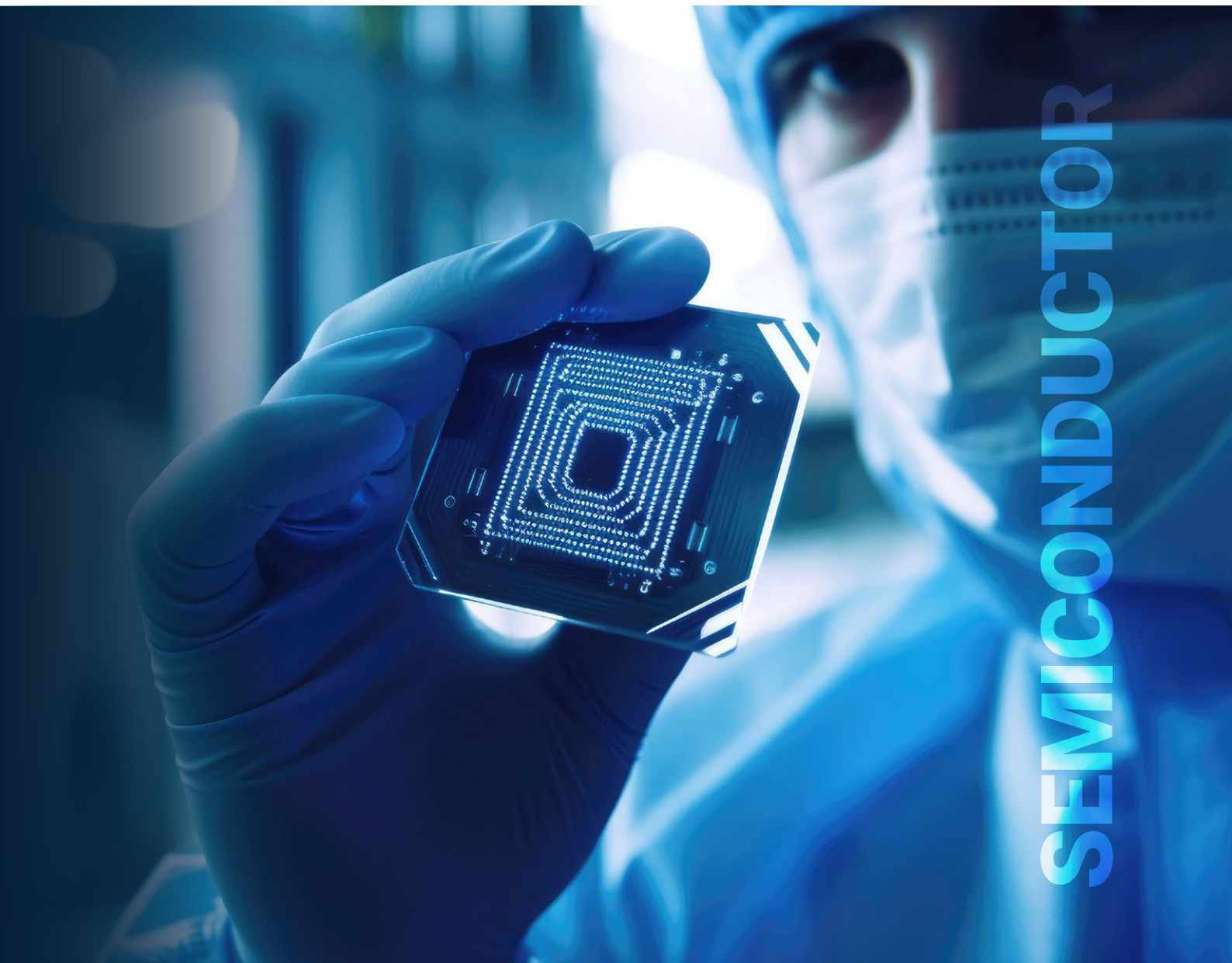
SEMICONDUCTOR

SEMI F47 standard

SEMI stands for "Semiconductor Equipment and Materials International" and is an international trade association of the semiconductor industry and its suppliers. The organization was founded in 1970 and organizes trade fairs, conferences and develops internationally recognized standards.

An important standard for the semiconductor production process is the SEMI F47. This standard focuses on the power supply of the semiconductor factories because they require high levels of power quality due to the sensitivity of equipment and processes. The semiconductor processing equipment is especially vulnerable to voltage sags as these events will cause the processes to fail.
The SEMI F47 specification defines the minimum voltage sag immunity that is needed for semiconductor processing and test equipment. The specification requires that tools be immune to voltage sags that commonly occur on AC power grids.

This standard was established over 20 years ago and has been refined and improved over the years. The standard has since proven its worth, and millions of dollars in manufacturing and tool downtime have been avoided due to increasing reliability and uptime of the equipment.

The current version of SEMI F47 specifies minimum voltage sag immunity requirements for equipment used in the semiconductor industry. Immunity is specified in terms of voltage sag depth and voltage sag duration so that a device continues to work seamlessly without interruption in the event of a power failure in the form of an AC supply undervoltage (sag) of max. 50% of the rated line voltage with a maximum duration of 1.7 seconds. In detail, the standard specifies the following.

| Sag of	Duration at 50 Hz	Duration at 60 Hz	Duration in seconds
50%	10 cycles	12 cycles	0,2
30%	25 cycles	30 cycles	0,5
20%	50 cycles	60 cycles	1
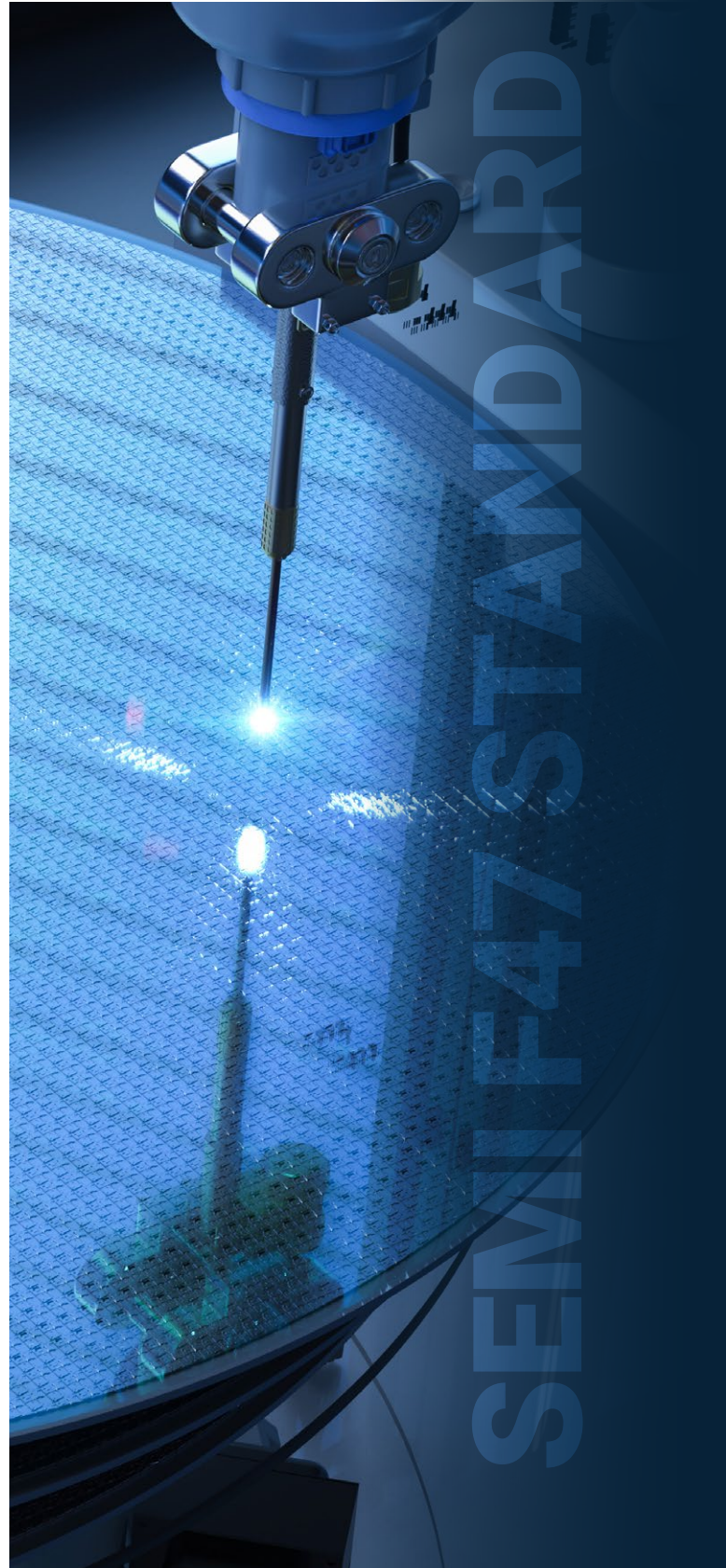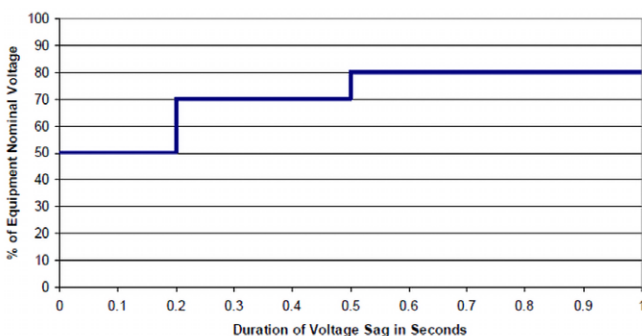
Test Equipment from EA

SEMI F47-compliant power supplies must be designed with high expertise and quality. Devices from the EA-10000 and the EA-10000 Industrial Series are designed to fulfill the requirements of the SEMI F47 standard and are tolerant against the specified voltage sags. SEMI F47 is a built-in feature that allows DC programmable power supplies from EA Elektro-Automatik contribute to a high level of process reliability within semiconductor processes.

The EA-10000 and the EA-10000 Industrial Series ensures stable DC output despite AC voltage fluctuations through advanced energy buffering. As a a user, you can distinguish between 2 different device behaviors. In SEMI F47 compliance mode, maximum output power is adjusted to guarantee reliability and DC output stability during voltage sags. Refer to the datasheet for detailed power adjustment specifications. For applications requiring full power with acceptable DC output fluctuations, an additional mode is available. This mode supports grid monitoring and low voltage ride through capability, maintaining full power operation suitable for processes that can tolerate brief DC output variations, such as thermal applications. The user can decide independently whether one of the 2 SEMI F47 functionalities should be used or not. The functionalities can be selected as an adjustable parameter in the menu of the device. With the EA-10000 series, this can be done directly in the front panel touch display. For the EA-10000 Industrial series, the function can be set via the control software EA-PC.

Power supplies from the EA-10000 and EA 10000 Industrial Series are the perfect choice to improve process quality. EA Elektro-Automatik makes vital contributions to support the semiconductor industry and drives the technology of tomorrow.
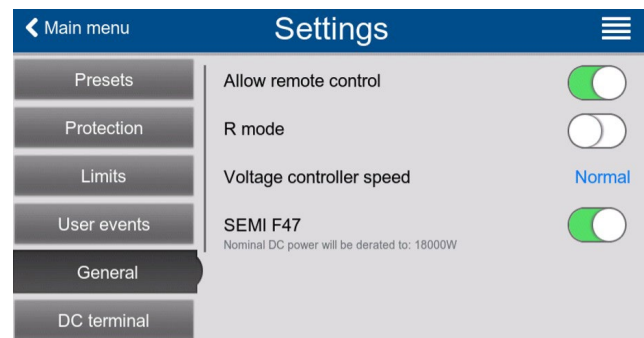
EA-10000 Industrial Series

EA-10000 Series

USA
MICHIGAN

USA
CALIFORNIA

GERMANY
SPAIN

KOREA

CHINA

SINGAPORE

Service for you worldwide

At EA Elektro-Automatik 450 qualified associates, in a facility of 19000m², research, develop, manufacture and market high-tech equipment for laboratory power supply, high power mains adaptors and electronic loads with or without power feedback. The sales and service network includes branches in China, Singapore and USA, offices in Spain and Korea as well as an extensive partner network. Since 2024 EA Elektro-Automatik has been part of the Tektronix Group, which has increased sales and service coverage globally.

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