

Semiconductor Fuse Quiz 1

How much do you know about semiconductor fuses?

A semiconductor is a device that becomes the brains of the equipment. It is made from a solid crystalline material, like silicon, which is modified (doped) by adding other elements, like arsenic or boron. By doing this the device is electrically activated and now controllable.

Semiconductor devices are very sensitive to overvoltage, current surges, and high temperature spikes. These occurrences can cause irreversible damage to the electrical properties of the semiconductor device which would make it inoperable.

Answers in orange.

Question 1: Which of these is a semiconductor?

- A. An IGBT
- B. An SCR
- C. A Diode
- D. A Transistor
- E. A GTO
- F. All of the above

Explanation

A semiconductor is a part-time conductor that is small in size with high power capability. It is used to rectify or control current to obtain a specific end. Due to its small size, it is highly susceptible to thermal energy damage.

Where are semiconductors used?

There is hardly an electric-powered product that exists today which doesn't rely on semiconductor technology. Semiconductors are the main component used to make power converters. Power converters are vital due to the ever increasing demand for energy. They promote equipment designs that are electrically efficient, smaller size, and lower cost.

There are four types of power converters:

- Rectifiers (AC to DC)
- Inverters (DC to AC)
- Choppers (DC-AC-DC)
- Cycloconverters (AC-DC-AC)

Power Converter equipment includes variable frequency drives called VFDs, motor soft starts and reduced voltage starters, Pulse Width Modulated control or PWM, and Uninterruptable Power supplies or UPS.

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Question 2: What is a semiconductor fuse?

- A. A fast-acting overvoltage protective device
- B. A fuse containing a semiconductor
- C. A very fast acting overcurrent protective device that limits heat energy during fault conditions
- D. A detonating device that uses a semiconductor for control

Explanation

Semiconductor devices are very sensitive to overvoltage, current surges, and high temperature spikes. These occurrences can cause irreversible damage to the electrical properties of the semiconductor device which would make it inoperable.

Semiconductor fuses open extremely fast when subjected to a high fault current, limiting the heat energy, referred to as "I" squared "t".

Correctly sized semiconductor fuses can open quickly during a fault, and limit the amount of energy seen by the components in the system. They can protect current-controlled devices like Diodes, SCRs and Thyristors so the equipment can continue operating by just replacing the fuses. If voltage controlled devices, IGBTs, are used, properly sized semiconductor fuses can reduce IGBT case rupture damage and can prevent collateral damage to neighboring components.

Semiconductor fuses are primarily intended for short circuit protection, not overload protection.

Question 3: Which of these two class types of semiconductor fuses provides full-range protection?

- A. gR-type
- B. aR-type

Explanation

Semiconductor fuses are used to protect against over-current conditions in semiconductor devices. They are designed to be fast acting and help to greatly limit the short circuit current.

They are available in two different class types:

- gR-type: Full-range protection for rectifiers. Overload and short circuit protection.
- aR-Type: Partial-range protection for rectifiers. Short circuit protection only.

Other IEC types:

- aM-type: Partial-range protection for motors
- gG-type or gL-type: Full-range protection for general applications

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Semiconductor Fuse Quiz 1 (continued)

Semiconductor fuses vary in size, shape, body type, terminals, and voltage ratings, and differ by regional standards. Here are some of the major differences between cylindrical and square body semiconductor fuses:

Cylindrical

Body: Ceramic or GMG (Glass Melamine Glass)
Contacts: Blade, Tapped, Ferrule
Voltage: 130V to 1500V
Form 101a, French Cylindrical

Square

Body: Ceramic
Contacts: IEC Blade, DIN, Tapped, NA Blade
Voltage: 450V to 1300V
PSC, British Standard, German Standard

Mersen's PSC Square Body Semiconductor Fuses

Mersen's PSC fuses are a specific type of square body fuse line that offers Protection for Semiconductors. PSC offers maximized efficiency and flexibility in manufacturing that supplies the versatility you need for equipment design and ultimate protection for today's power conversion equipment.

PSC fuses are primarily used for the protection of rectifiers, inverters, DC drives, UPS systems, and reduced voltage motor starters, but also offer the diversity you need for your global equipment requirements.

Mersen's PSC fuses are available in a wide range of fuse types, voltages, and mounting styles with special electrical characteristics required to protect power electronics equipment.

Additional Resources

- [PSC Protection Semiconductor Square Body Fuses Brochure](#)
- [PSC Introduction video](#)