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TND322

What is a TSPD?

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TECHNICAL NOTE

The TSPD or Thyristor Surge Protection Device are specialized silicon based overvoltage protectors, used to protect sensitive electronic circuits from damaging overvoltage transient surges caused by induced lightning and powercross conditions.

The TSPD protects by switching to a low on state voltage when the specified protection voltage is exceeded. This is known as a “crowbar” effect. When an overvoltage occurs, the crowbar device changes from a high−impedance to a low−impedance state. This low−impedance state then offers a path to ground, shunting unwanted surges away from the sensitive circuits.

This crowbar action defines the TSPD’s two states of functionality: Open Circuit and Short Circuit.

Open Circuit – The TSPD must remain transparent during normal circuit operation. The device looks like an open across the two wire line.

Short Circuit – When a transient surge fault exceeds the TSPD protection voltage threshold, the devices switches on, and shorts the transient to ground, safely protecting the circuit.

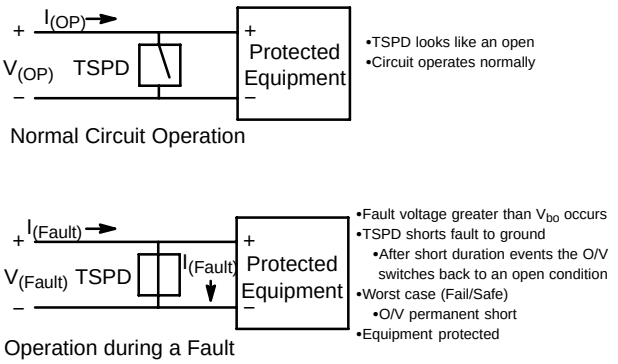

Figure 1. Normal and Fault Conditions

The electrical characteristics of the TSPD help the user to define the protection threshold for the circuit. During the open circuit condition the device must remain transparent; this is defined by the I_{DRM}. The I_{DRM} should be as low as possible. The typical value is less than 5 μA.

The circuit operating voltage and protection voltage must be understood and considered during circuit design. The $V_{(BO)}$ is the guaranteed maximum voltage that the protected circuit will see, this is also known as the protection voltage. The V_{DRM} is the guaranteed maximum voltage that will keep the TSPD in its normal open circuit state. The TSPD $V_{(BO)}$ is typically a 20−30% higher than the V_{DRM}. Based on these characteristics it is critical to choose devices which have a V_{DRM} higher than the normal circuit operating voltage, and a $V_{(BO)}$ which is less than the failure threshold of the protected equipment circuit. A low on−state voltage V_t allows the TSPD to conduct large amounts of surge current (500 A) in a small package size.

Once a transient surge has passed and the operating voltage and currents have dropped to their normal level the TSPD changes back to its open circuit state.

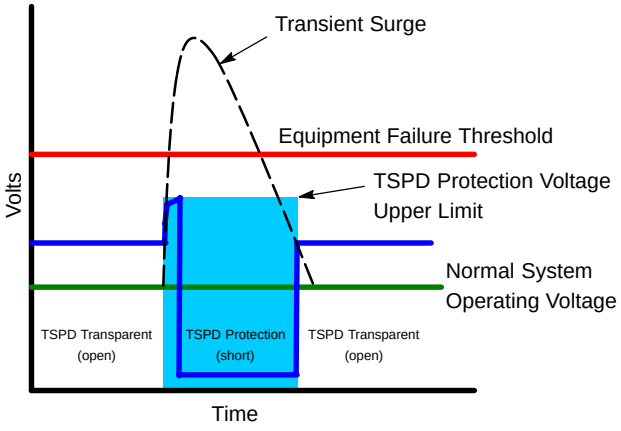

Figure 2. Protection During a Transient Surge

TSPD’s are useful in helping designers meet safety and regulatory standards in Telecom equipment including GR−1089−CORE, ITU−K.20, ITU−K.21, ITU−K.45, FCC Part 68, UL1950, and EN 60950.

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