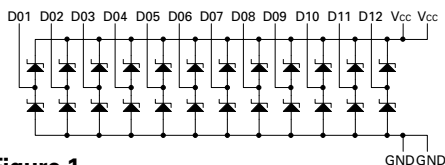


## Features and Applications of the SDA24 Schottky Array

### Bus Termination for High Speed Data Systems

#### SDA24 - Schottky array

The SDA24 is a monolithic array of 24 Schottky diodes, arranged as 12 series pairs. The diode array appears schematically in Figure 1 below. In practice the cathodes are commoned together and connected to the positive rail, ( $V_{cc}$ ) in the system; the commoned anodes being connected to ground. Each data line is then connected to the mid point of each series pair.



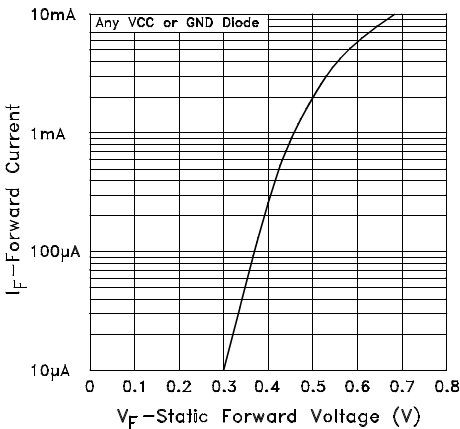
**Figure 1**  
**Schottky Barrier Diode Bus Termination Array**

Transients occurring on the data or clock lines of memory or LSI Logic devices (e.g. **DRAM**, **SRAM**, Hard disc controllers), can result in improper operation, data loss or even damage to the devices' input circuitry. These transients can be caused by transmission line reflections, crosstalk between lines, switching noise and external influences such as radiated supply glitches.

The first devices to use a diode clamp were CMOS logic gates, in order to

provide protection against ESD during handling. However, the use of Schottky arrays goes beyond protection and so they are referred to as **Termination Arrays**. Transmission lines operating at high speed require effective terminations, otherwise, the reflections created on the line would corrupt the data signals and necessitate re-transmission. Transmission line theory states that a terminating resistance, equal to the characteristic impedance of the line should be used to provide a perfect match. In practice however, use of resistive termination networks in digital systems can lead to an increased power consumption, inferior noise immunity and, for some networks increased propagation delays.

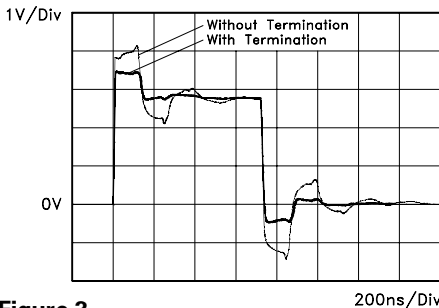
Schottky diode arrays do not suffer from any of the above drawbacks. Under normal conditions, the diode pairs connected to each line are almost transparent to the data signal - the only effects being a slight capacitive loading due to the depletion capacitance, and any diode reverse leakage current. However, if the voltage at the junction of the series pair increases above  $V_{cc}$  or decreases below ground, due to a transient or pulse reflection, then the upper (or lower) diode respectively will start to conduct. This dissipates the over/under voltage to the appropriate supply rail. The series pair can then be seen as a voltage clamp that is effective at a  $V_f$  above and below the



**Figure 2**  
**Low  $I_F$  vs  $V_F$  Characteristic**

supply rail. E.g. on a 5V supply, each Schottky pair will contain the data signal within a  $5V + V_f$  and  $0V - V_f$  window, where the  $V_f$  will be typically 0.4V at low currents. (Please refer to figure 2).

The waveforms in Figure 3 illustrate this action, and were produced by driving a 10m length of typical digital comms coaxial cable. The effect of voltage clamping can be seen on the first



**Figure 3**  
**Example Scope Display Effect of terminating Schottky pair on a pulse transmission**

overshoot, and the subsequent reflections are reduced almost to zero.

## Applications

Applications for these arrays can be found in areas where high speed parallel data communication is required such as:

- Termination networks
- Network peripherals
- Hard disc drives
- CD ROM drives
- Floptical Drives
- DAT drives
- Disc arrays

## Glossary

**RAM**-Random Access Memory - an LSI device used to store binary data. The data is stored within a matrix of cells that are referenced using an address. The device is able to be written to/read from in any order, (hence random), and is a "volatile" store - if the supply is removed, the data will be lost.

**DRAM**-Dynamic RAM - this form of RAM needs to be continually refreshed, otherwise the data will be lost, and so requires an additional refresh controller, though some microprocessors supply this function automatically.

**SRAM**-Static RAM - this doesn't require a refresh function as does dynamic RAM. It will store data written to it until it is changed by the system or lost by a power loss or shut down.

**CROSSTALK** -The noise or signal leaked or induced from one circuit, bus or IC section to another.