

Application Note 065 Using the SLC800 and STS700 in a Modem Data Access Arrangement (DAA)

Introduction:

The primary function of a modem data access arrangement (DAA) is to provide a path for the transmission of data from a high-voltage tip-to-ring phone line through an isolation barrier (typically 1500 V_{AC}) into the modem for further processing.

Solid State Optronics offers two integrated products that perform several of these DAA functions:

The SLC800 is a linear optocoupler used to pass AC signals through a 1500 V isolation barrier. In essence, the SLC800, used in conjunction with operational amplifiers on the input and output, behaves like a transformer in a solid state package. The SLC800 comes in a standard 8-pin DIP.

The STS700 is multi-function device that performs hookswitch, ring detect and electronic inductor functions. The STS700 is offered in a standard 16-pin DIP.

Description:

The SLC800 consists of an input GaAs LED optically coupled to two photodiodes. One of the photodiodes is typically used in a servo feedback arrangement to the SLC800 input via an operational amplifier. This is referred to as the servo photodiode. The other photodiode is used to feed the output circuitry, typically another op amp. This is referred to as the forward photodiode.

The SLC800 achieves superior linearity using two important functions: 1) the servo feedback setup which linearizes the LED's output; 2) excellent gain matching between the two photodiodes. For further information on the SLC800, please refer to Application Note 060, "SLC800 Linear Optocoupler In An Isolation Amplifier Circuit".

The STS700 is a multi-function device consisting of a solid state relay, optocoupler, Darlington transistor and bridge rectifier. The relay is used primarily as a hookswitch; the optocoupler is typically used as a ring detector. The bridge rectifier guarantees proper voltage polarity into the Darlington, which in turn is used with additional circuitry to simulate the action of

an inductor. This electronic inductor is used to sink normal DC line current and allow AC data signals to pass through to the modem's data pump.

Operation:

The basic operation of a DAA can be illustrated through the use of a highly simplified block diagram:

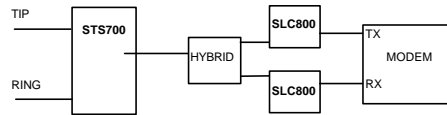


Figure 1: Simple DAA Block Diagram

Suppose a two-way line of communication has been set up and you wish to send data via your modem. The data first travels from TX through the SLC800 linear optocoupler on its way to the tip/ring of the telephone line. The SLC800 provides a 1500 V isolation barrier and preserves the integrity of the signal.

Finally, the signal passes through the closed hookswitch, which is contained in the STS700. The hookswitch is controlled by the modem's off-hook command. The data ignores the high DC impedance path provided by the electronic inductor and is eventually capacitively coupled to the tip/ring of the telephone line. A receive path exists in a similar manner; the hybrid circuit is responsible for separating transmit and receive signals.

For simplicity sake, some of the functionality of the STS700 is not shown. For example, the modem will typically send the off-hook command through to pin 3 of the STS700 to close the hookswitch. Also, when the central office passes the ring signal through the tip/ring interface, the STS700's ring detect function will signal the modem that a call is ready to be answered. A diode bridge is contained in the STS700 to guarantee proper polarity of the signal into the Darlington transistor.

Conclusion:

By using a combination of the SLC800 and STS700, the user can achieve several necessary functions of a modem DAA. The SLC800 provides excellent signal matching across a 1500 V isolation barrier. This isolation barrier protects the low voltage digital circuitry on the modem side of a DAA from the high voltage telephone line. In conjunction with operational amplifiers and the electronic inductor capability of the STS700, the SLC800 acts like a transformer in a solid state package.

The STS700 provides several functions. With some additional circuitry, an electronic inductor can be built from the package's Darlington transistor. A diode bridge is connected to the Darlington to guarantee proper polarity. This electronic inductor setup provides a high DC impedance and low-impedance path for AC signals.

The STS700 also offers a standard hookswitch solid state relay and ring detect optocoupler in a tidy 16-pin package.

The SLC800 and STS700 work together to provide an elegant solution for modem designers looking to pack functionality and high performance in relatively small packages.