May 03, 2001

APPLICATION NOTE 73: DS2107A Active Negation

This application note describes active negation and the need for SCSI terminators, such as the DS2107A, to be able to handle the loads active negation imposes.

The DS2107A is used in SCSI systems to provide active termination for 9 signal lines. In the typical 8 bit-wide data configuration (A cable), two DS2107A's are required to fully terminate the bus (9 control lines + 8 data lines + 1 parity line). In the 16-bit wide data configuration (P cable), three DS2107A's are required to fully terminate the bus (9 control lines + 16 data lines + 2 parity lines). The two packages available are DS2107AS, 16-pin SOIC, and DS2107AE, 20-pin TSSOP (Thin Shrink Small Outline Package).

The SCSI bus is defined to use termination at the two physical ends of the bus. If a device is connected in the middle of the bus, the total lumped capacitance of the device is limited on each signal line. Section 7.1.4 of the SCSI-3 Parallel Interface specification defines this value as 25 pF. Annex E defines the measurement of the pin capacitance:

"The objective of this procedure is to determine the lumped capacitance imposed on each signal conductor of the bus proper by an SCSI device connected thereto. The model for this procedure assumes the bus in ribbon cable form passing through an insulation-displacement SCSI connector, the mating part that is mounted on an SCSI device controller printed-wire

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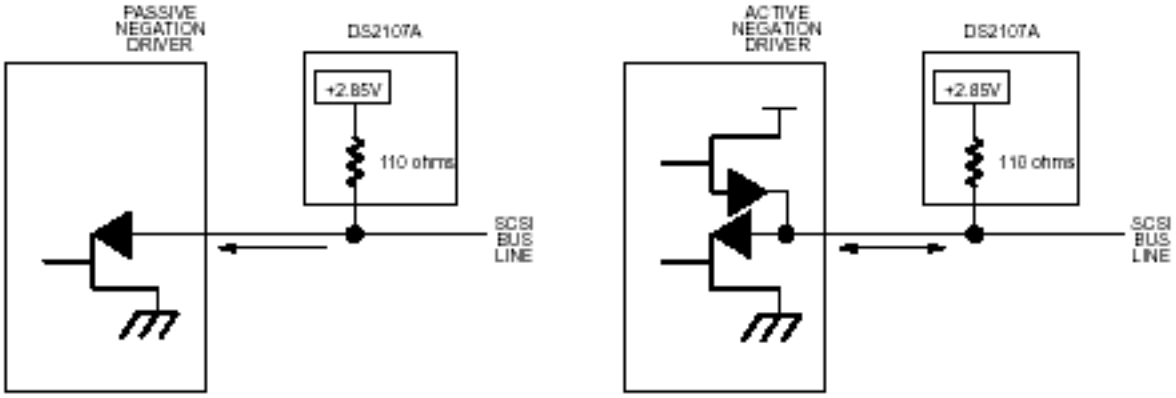
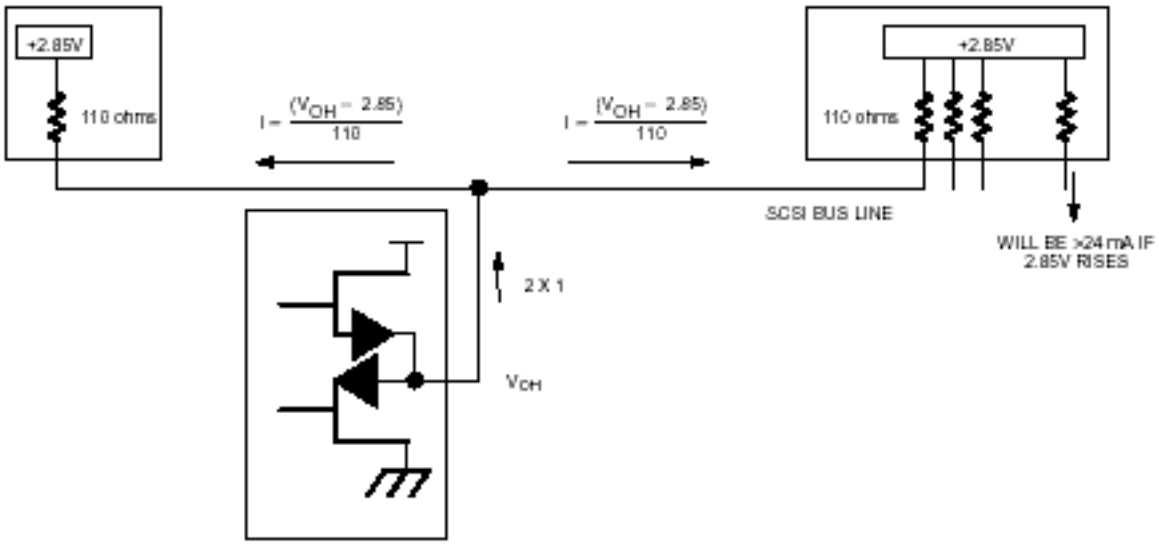
What is Active Negation?

Active negation is a technique used by the newer SCSI-2 and SCSI-3 bus drivers on single-ended SCSI buses to insure clean monotonic transitions of the signal. Drivers employing active negation contain the ability to not only sink current but to source current as well. These drivers usually "yank" the SCSI signal to its negated state (i.e. high) by actively pulling the signal high with a driver capable of sourcing current. The SCSI-3 Parallel Interface specification states: " Additional benefit may be achieved by using active-negation drivers on the DATA BUS and parity signals when operating in fast synchronous data transfer mode by reducing the skews between the first group of signals (ACK, REQ, ACKQ, REQQ) and the DATA BUS and parity signals."



Why Must Terminators be able to Handle Active Negation?

When a driver actively negates an SCSI signal, the bus may be pulled higher than the termination voltage present in the active terminators. If this occurs, current will begin flowing into the regulated 2.85V termination voltage. If the active terminator cannot sink all of the current that is being sourced by the driver, then it will begin to raise above its nominal 2.85V termination voltage which will result in current greater than the 24 mA being sourced on the other SCSI bus signals being shared by the active terminator (which violates the SCSI specifications). Since drivers can be placed at any point along the SCSI bus and terminators only exist at the physical end of the bus, all active terminators must be able to fully sink all of the current generated by the active-negation drivers.



How Much Current Must an Active Terminator Sink?

The SCSI-3 Parallel Interface specifications allows up to 20 mA sourced current per driver line. On "by nine" termination schemes like the DS2107A, this means the terminator must be able to sink 180 mA (9 lines x 20 mA/ line). The DS2107A can sink at least 200 mA, which is within this limit.board. The bus connector is removed from the device, along with every source of power.

One or more device connector circuit-common pins are connected together to form an effective circuit-common node. An R-F admittance bridge (or equivalent), operation at 1.0 MHz, is connected successively to each signal pin in the device connector, with reference to the circuit- common node.

The signal applied during the measurement shall be biased to 0.5 Vdc.and shall be 0.4V peak to peak in amplitude.

The characteristics shall be determined in terms of a parallel combination of a conductance and a capacitive susceptance. The corresponding capacitance thus determined is the maximum signal capacitance referred to in

clause 7.1.4."

The DS2107A was measured using an HP4194A Impedance Bridge, and then verified using a lowpass RC network and an LC resonance circuit. The power down capacitance using the Impedance Bridge was measured to be 8.1 pF. The RC network shown in Figure 1 yielded 8.0 pF, and the LC resonance circuit of Figure 2 measured 8.6 pF. V_S of both Figure 1 and Figure 2 is comprised of Vdc = 0.5V, Vac = 0.4 p-p, and f = 1 MHz.

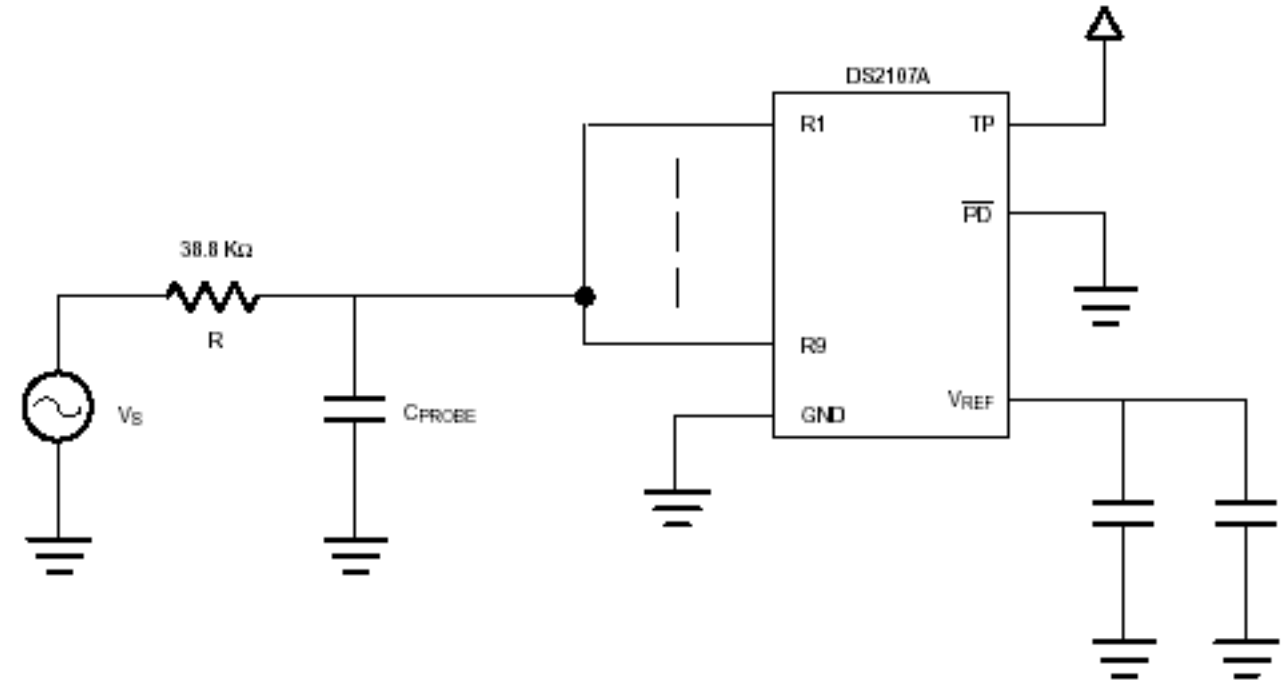


Figure 1

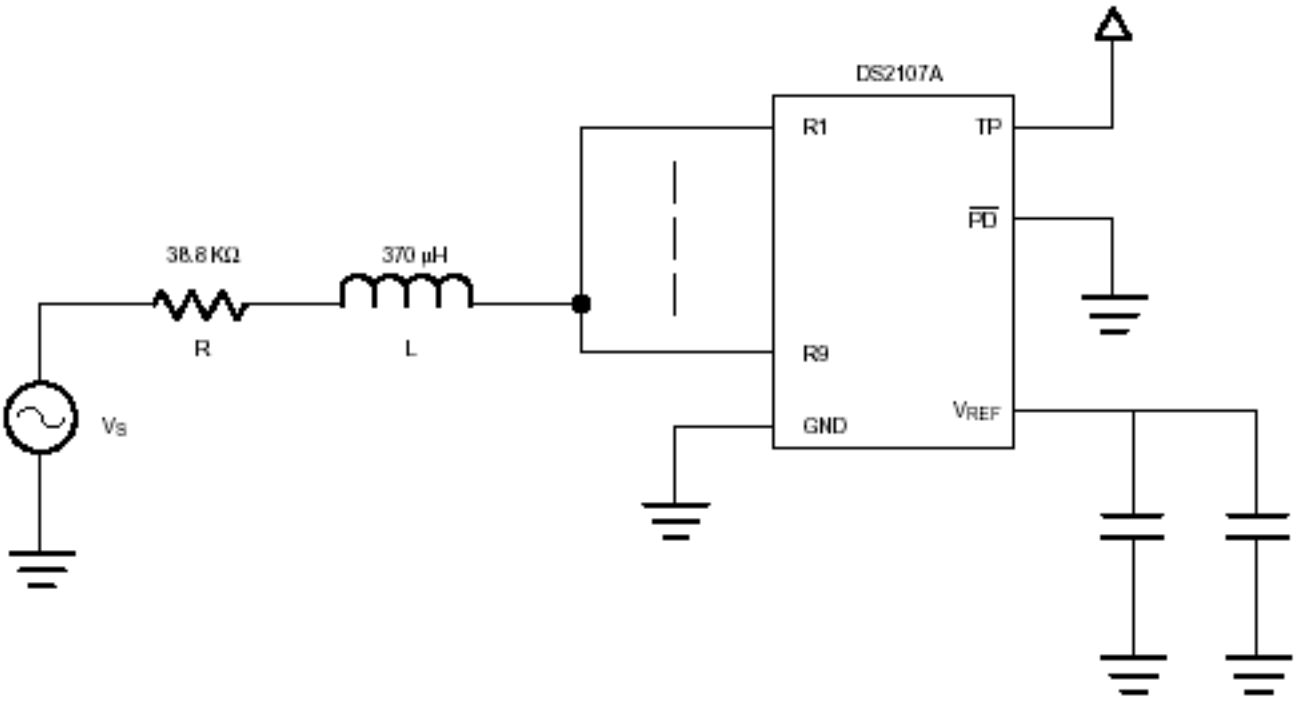


Figure 2

More Information

DS2107A: QuickView -- -- Free Samples