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APPLICATION NOTE 3523

Connecting the DS2125 SCSI Terminator in Wide-Bus Applications

Abstract: This application note describes how to connect a SCSI terminator for wide-bus cable and host bus adapter (HBA) terminations.

Introduction

Much has been written about SCSI (Small Computer System Interface) bus system performance. However, very little information has been provided to new users regarding the physical bus connections. In this application note, we begin at the system level and proceed down to the actual pin-level connections. Our purpose is to provide the new SCSI user with the kind of detail necessary to connect the DS2125 terminator in a typical wide-bus application.

SCSI Network Applications

Figure 1 illustrates a typical SCSI network application. This diagram demonstrates the variety of devices that can be connected to the SCSI bus. In the figure, the workstation acts as the main controller. Thus, the host bus adapter (HBA) card will have on-board SCSI termination, reside within the workstation enclosure, and be connected to the computer motherboard. The SCSI hub will provide the end of the bus termination and branch out to another SCSI network through three or more ports.

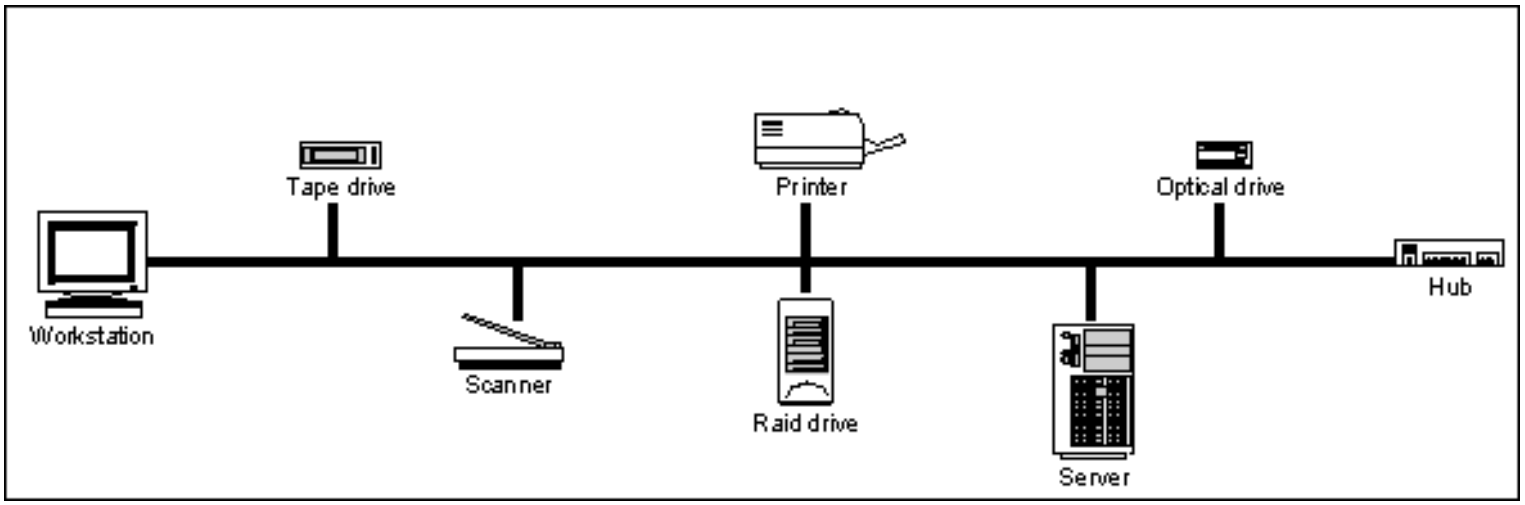

Figure 1. Typical SCSI network application.

In this configuration, however, it is not obvious that small subsystems can be connected to a shared network bus. For example, in the case of the RAID (redundant array of independent disks) drive, there can be multiple SCSI drives connected in the RAID enclosure. This RAID enclosure provides its own SCSI termination. The same is true of the server subsystem.

In **Figure 2**, we take a closer look at a disk subsystem. As previously stated, the HBA card will be connected to the motherboard. The diagram illustrates the daisy-chained connection from the HBA to n+ disks. Up to 16 devices, including the HBA card, can be connected to a single SCSI bus in Ultra3 and other wide-bus applications.

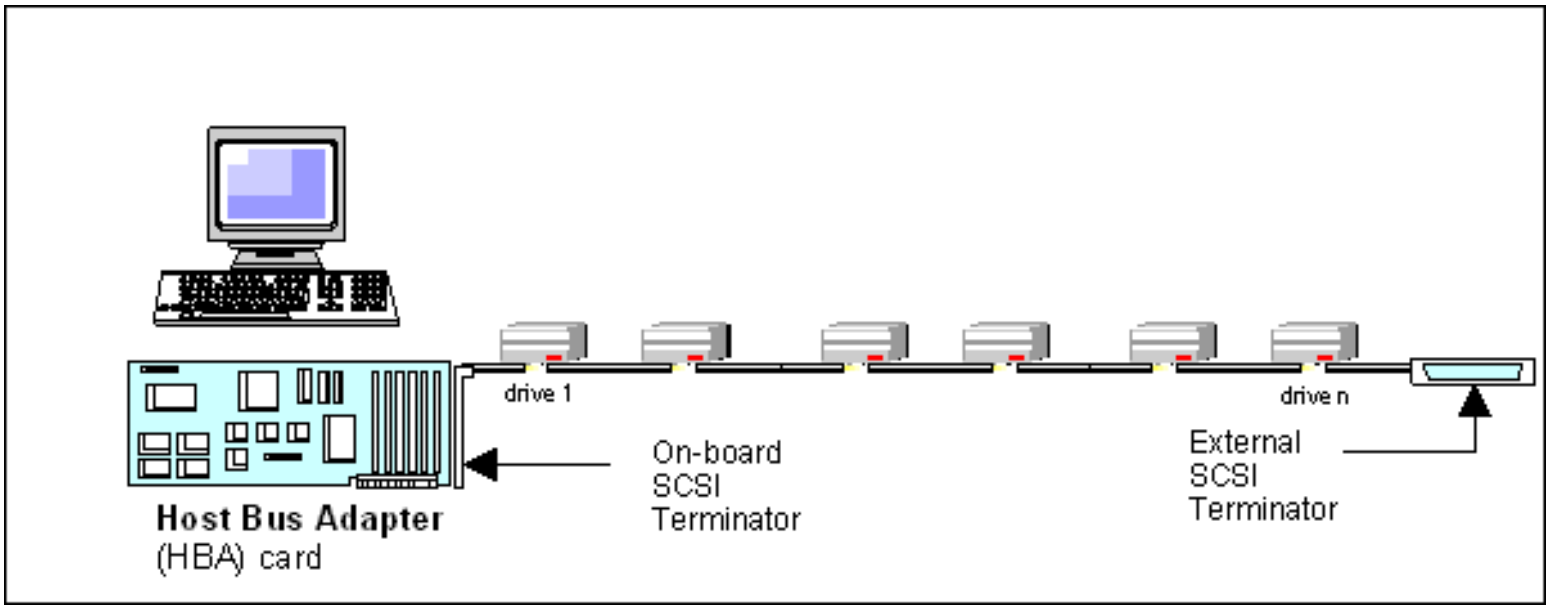

Figure 2. Typical SCSI disk-drive system.

The example below shows termination on the HBA card and on the SCSI cable. Therefore, only two terminators are required; one at the beginning of the bus on the HBA and the other at the end of the cable. In some cases, termination can be connected to the last disk drive in lieu of terminating the cable. However, under no circumstances should both the disk drive and the cable be terminated. Additional termination could impede system performance and possibly cause a marginal loss of data integrity.

The DS2125 is a 15-line LVD/SE SCSI terminator IC that provides the proper impedance levels for both single-ended (SE) and low-voltage-differential (LVD) signals. Therefore, in SE mode 15 lines are used and in LVD mode 15 pairs are used to provide the proper line impedance.

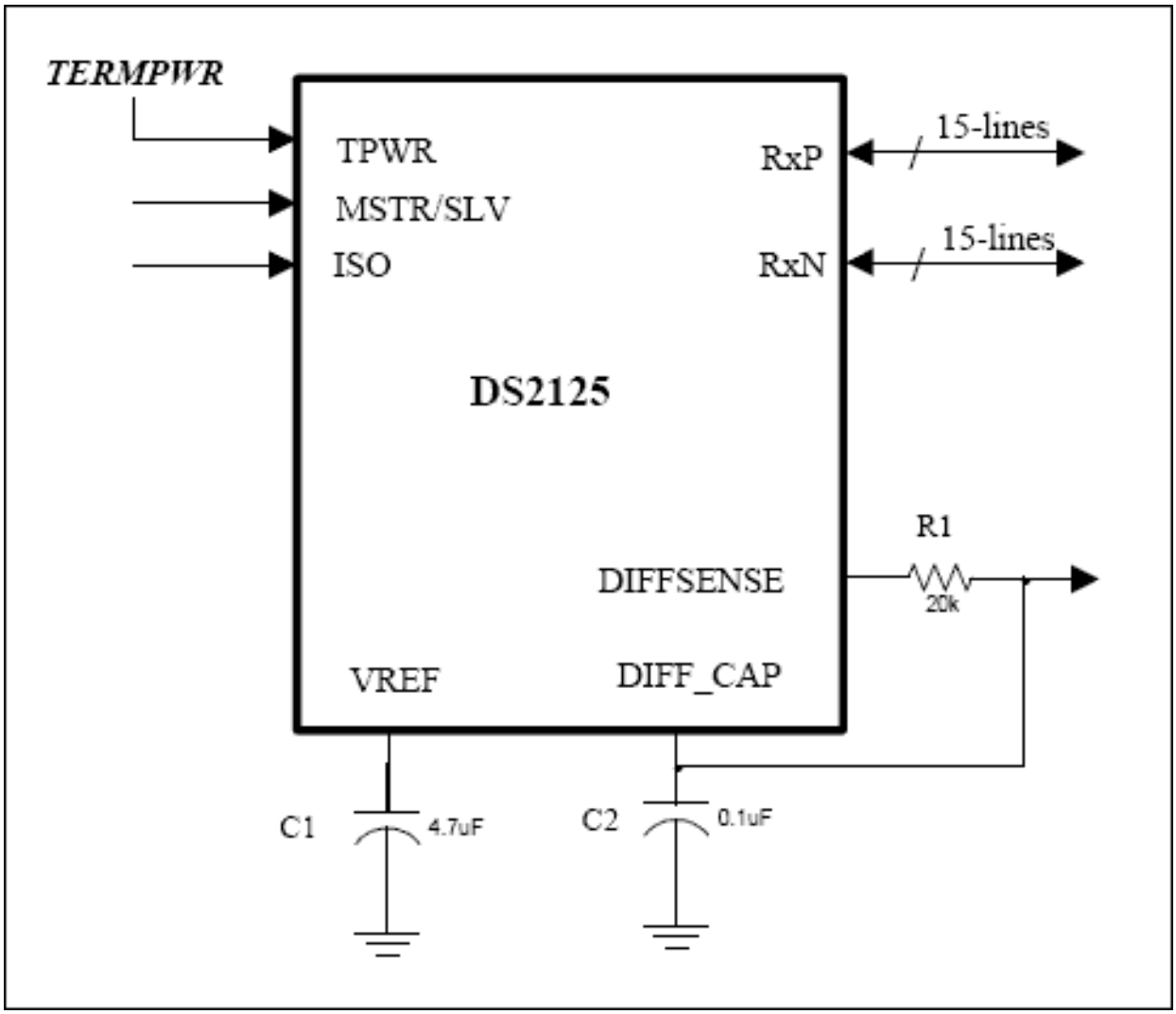

Figure 3a. DS2125 Ultra3 LVD/SE multimode SCSI terminator block diagram.

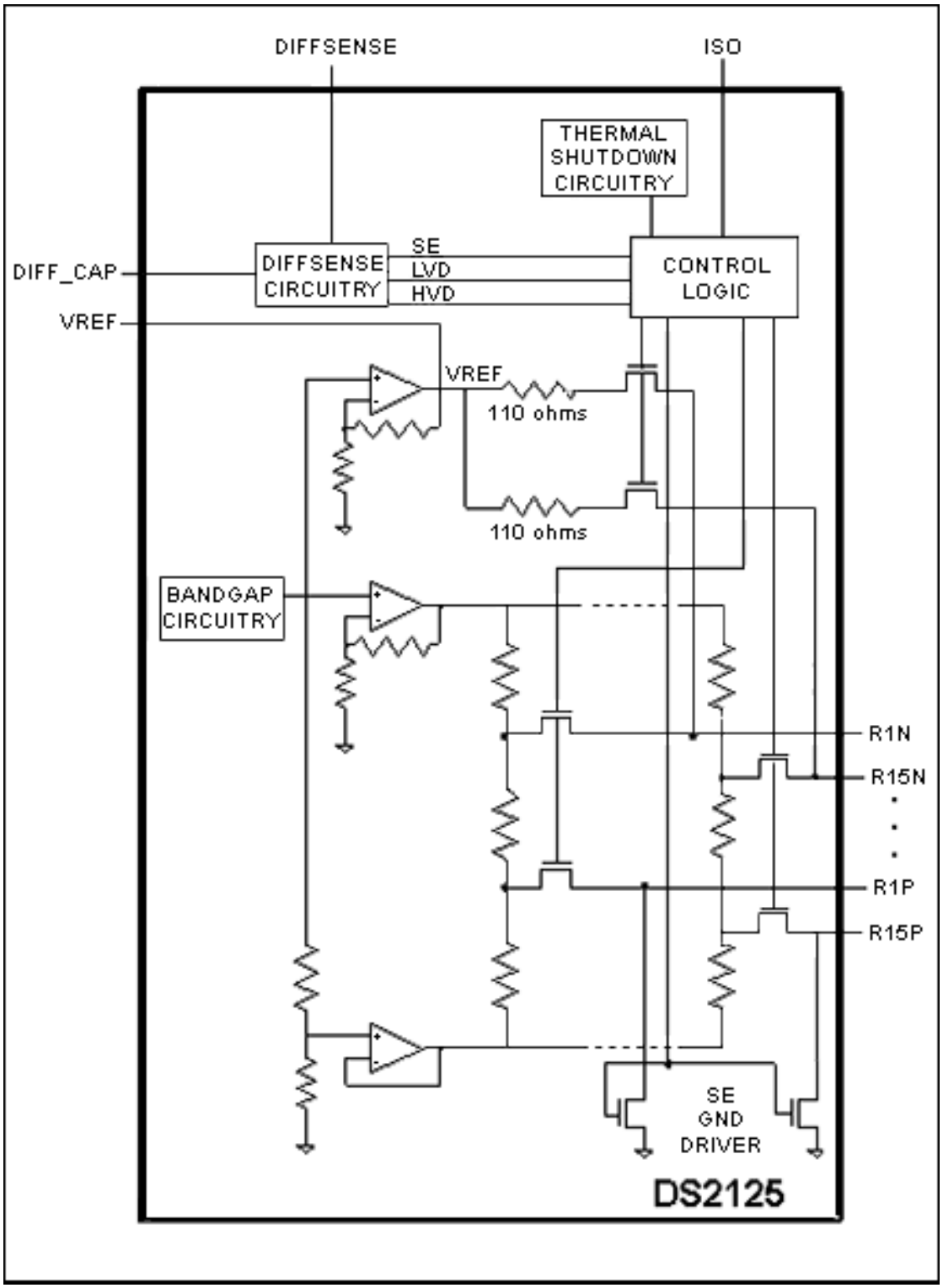

Figure 3b. DS2125 Ultra3 LVD/SE multimode SCSI terminator functional block diagram.

In a typical application, the SCSI devices are daisy-chained as shown in **Figure 4**. The DIFF_CAP signal monitors the DIFFSENS line to determine the proper operating mode of the device. The DIFFSENSE pin can also drive the SCSI DIFFSENS line (when MSTR/SLV = 1) to determine the SCSI bus operating mode. The DS2125 combines LVD and SE termination with DIFFSENS sourcing and detection.

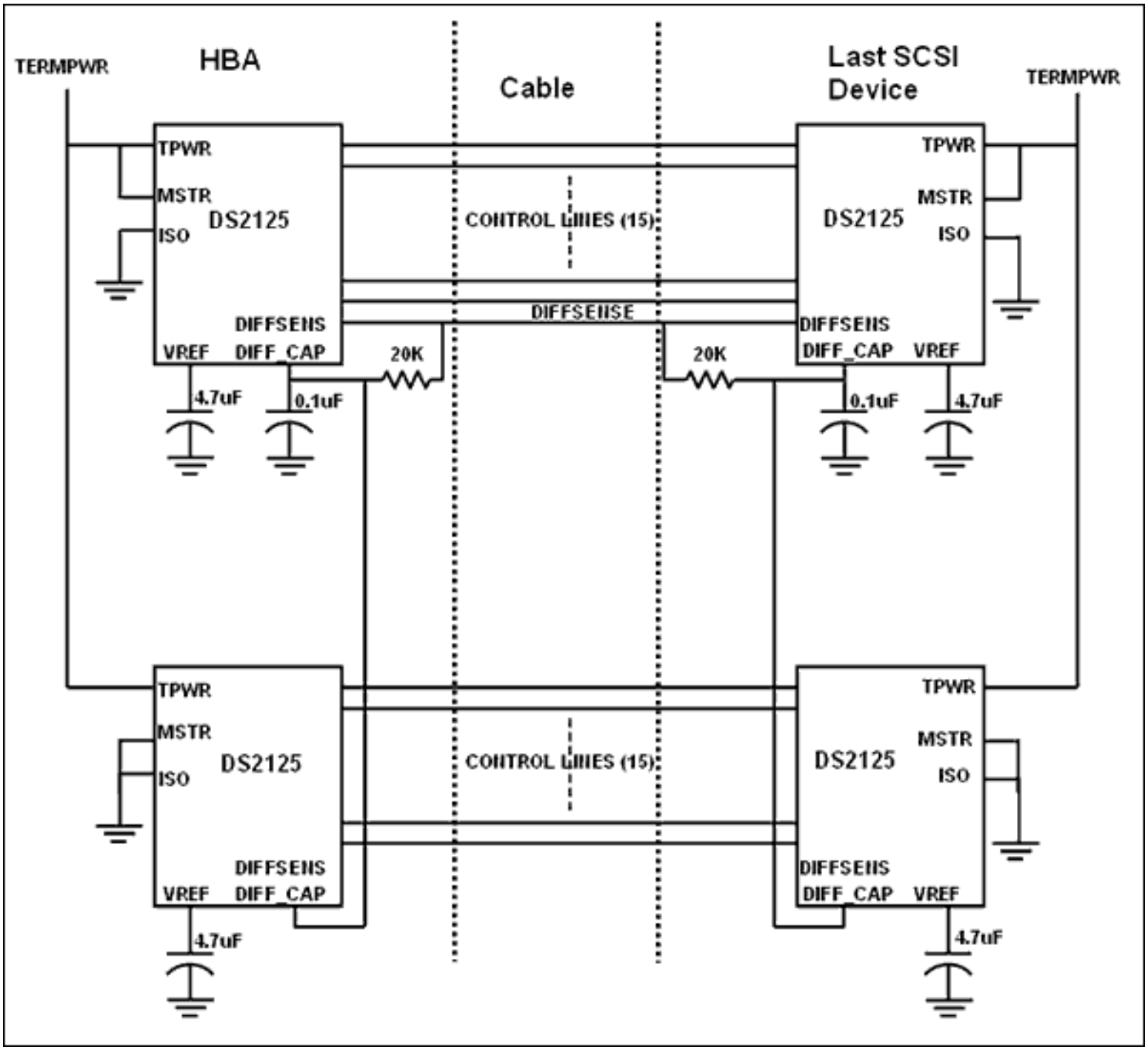

Figure 4. Typical DS2125 SCSI bus connections.

A bandgap reference is fed into two amplifiers, which creates a 1.25V reference voltage in LVD mode and a 2.85V reference voltage in SE mode. That same control logic will switch in/out parallel resistors to change the total termination resistance accordingly. In SE mode, the RxP pins will switch to ground.

The DIFFSENSE circuitry decodes trinary logic. There will be one of three voltages on the SCSI DIFFSENS control line. If the voltage is below 0.6V, SE mode is selected. If DIFFSENS is above 2.15V, HVD mode selection causes the DS2125 to isolate itself from the bus. If the DIFFSENS line is between 0.6 V and 2.15V, LVD mode is selected. The ISO input pin, as shown in Figure 4, may be pulled high by the HBA to isolate all the devices from the bus.

Figure 5 is a complete wiring diagram of the SCSI wide-bus application. The diagram shows an end-of-the bus application connected to the 68-pin P-type connector. Because each end of the wide-bus requires two DS2125 SCSI terminators, a total of four devices are needed to terminate the path, as shown in Figure 4. Please note that there is one device selected on each end of the bus as the master. When the MSTR/SLV pin is pulled high, the DIFFSENSE pin will output the appropriate mode level to be detected by the DIFF_CAP pins.

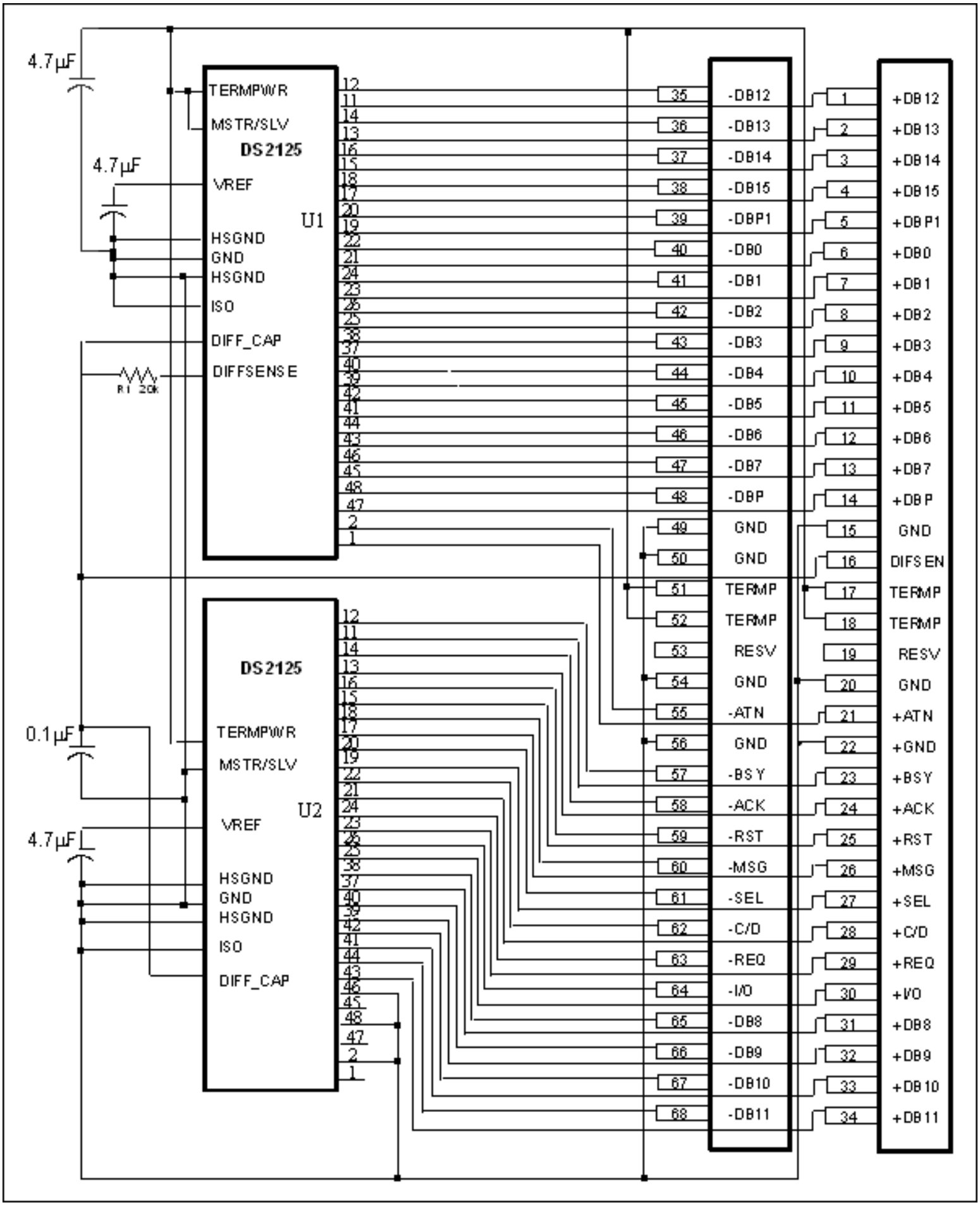

Figure 5. Typical SCSI wide-bus pin connections.

LVD / MSE Contact Assignments—P Cable

- LVD/MSE contact assignments - P cable

Signal name	Connector contact number	Cable conductor number		Connector contact number	Signal name
+DB(12)	1	1	2	35	-DB(12)
+DB(13)	2	3	4	36	-DB(13)
+DB(14)	3	5	6	37	-DB(14)
+DB(15)	4	7	8	38	-DB(15)
+DB(P1)	5	9	10	39	-DB(P1)
+DB(0)	6	11	12	40	-DB(0)
+DB(1)	7	13	14	41	-DB(1)
+DB(2)	8	15	16	42	-DB(2)
+DB(3)	9	17	18	43	-DB(3)
+DB(4)	10	19	20	44	-DB(4)
+DB(5)	11	21	22	45	-DB(5)
+DB(6)	12	23	24	46	-DB(6)
+DB(7)	13	25	26	47	-DB(7)
+P_CRCA	14	27	28	48	-P_CRCA
GROUND	15	29	30	49	GROUND
DIFFSENS	16	31	32	50	GROUND
TERMPWR	17	33	34	51	TERMPWR
TERMPWR	18	35	36	52	TERMPWR
RESERVED	19	37	38	53	RESERVED
GROUND	20	39	40	54	GROUND
+ATN	21	41	42	55	-ATN
GROUND	22	43	44	56	GROUND
+BSY	23	45	46	57	-BSY
+ACK	24	47	48	58	-ACK
+RST	25	49	50	59	-RST
+MSG	26	51	52	60	-MSG
+SEL	27	53	54	61	-SEL
+C/D	28	55	56	62	-C/D
+REQ	29	57	58	63	-REQ
+I/O	30	59	60	64	-I/O
+DB(8)	31	61	62	65	-DB(8)
+DB(9)	32	63	64	66	-DB(9)
+DB(10)	33	65	66	67	-DB(10)
+DB(11)	34	67	68	68	-DB(11)

The conductor number refers to the conductor position when using planar bulk cable.

More Information
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AN3523, AN 3523, APP3523, Appnote3523, Appnote 3523