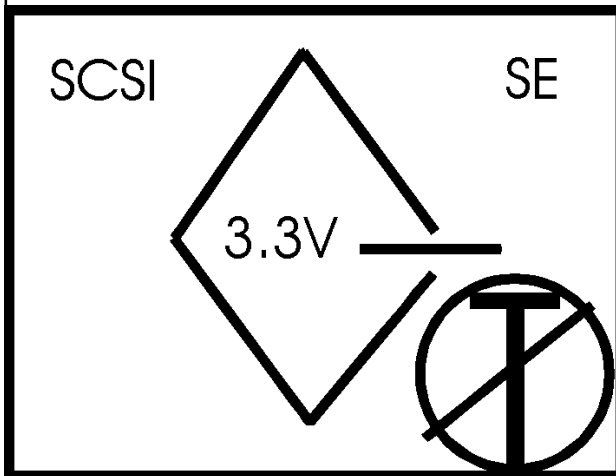


3.3 Volt SCSI Termpwr

- **3.3 Volts TERMPWR Source.**
 - 3.3 Volts minus JEDEC tolerance is 3.0 Volts.
 - 3.3 Volt systems should connect to 5 Volt SCSI termpwr requiring a regulator for 2.8 to 5.25 Volt operation.
- **Unidirectional Circuit Breaker Required for less than 0.2 Volt drop.**
 - Section reference SPI 7.3 Add note Use a Unidirectional Circuit Breaker for 3.3 Volt systems.
 - Circuit Breaker Maximum drop, 0.2 Volts under full load
 - Cable drop 0.1 Volts with 1/2 load
 - Terminator regulator drop less than 0.2 Volts, all lines 24 mA load.
- **Change from SPI Table 7 (add) 3.3 Volt Single-ended 2,90 VDC Min 5,25 VDC Max 1000 mA for 8 Data bit buses.**
- **Change from SPI Table 7 (add) 3.3 Volt Single-ended 2,90 VDC Min 5,25 VDC Max 1500 mA for 16 Data bit buses.**

3.3 Volt Basics

- **3.3 Volt Requires 2.8 Volt terminators at the far end or power from an other device.**
 - Standard termination requires at least 4.0 Volts.
 - Not all 3.3 Volt systems can provide power for the far end terminator.
 - 3.3 Volt Terminators must work to 5.25 Volts.
 - Addition Special Icons showing users the limitations instead of the symbols shown in SPI Annex H.



Circle/Slash used when Termpwr is not adequate for the far end.

Termination

- **Regulated Termination**
 - SCSI-3 SPI Maximum pull up current is 24 mA at 0.2V.
 - SCSI-3 SPI minimum pull up voltage is 2.5 Volts.
- **Battery systems often require TERMPWR to be supplied externally.**
 - Termpwr could be from a 5.25 Volt source, which requires all 3.3 Volt systems to run with 2.7 to 5.25 Volt TERMPWR.
- **Change from SPI section to 7.1.1 3.3 Volt Systems the terminators must regulate with TERMPWR from 2,7 VDC to 5,25 VDC**
- **The regulated terminators shall use source/sink regulators to reduce overshoot, high Active Negation Driver pull up voltage, and protect 3.3 Volt Logic.**
- **High voltage clamp to protect logic 3.6 Volts (AMD)**

3.3 Volt Logic Issues

- **Maximum SPI-LV bus Voltage, ViH**
 - 3.6 Volts is the maximum recommended voltage for 3.3 Volt logic. The JEDEC standard is 3.3 Volts +/- 0.3 Volts.
 - Some controllers may require clamping when connected to 5 volt SCSI units that drive signal lines above 3.6 Volts.
- **Standard meet current standard levels except ViH maximum**
 - There is not problem using the standard thresholds for 3.3 Volt logic. 2.0 Volts is the maximum high Threshold.
 - Recommended termination reference voltage is 2.5 to 3.0 Volts.
 - Maximum pull up current with Tempwr from 2.7 to 5.25 Volts is 24 mA at 0.2 Volts.
 - Terminators should not source current when the line is over 3.24 Volts.

X3T10/94-164R2 SPI-LV SCSI-3 SPI Low Voltage

November 21, 1994

Abstract:

This standard defines the additional requirements for 3.3 Volt applications over the SCSI-3 Parallel Interface (SPI) standard. This is not a standalone document, but an additional requirements document for 3.3 Volt applications, only the differences with SPI are defined in this document.

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1.0 Foreward:

There is a requirement that has developed by the 3,3 Volt Logic, PCI, Laptop and PCMCIA for a low voltage version of SCSI-3 SPI. This effects the TERMPWR voltage, termination and maximum signal voltage, it does not effect the thresholds.

Low Voltage systems must interoperate with standard SCSI buses and devices, it may clamp bus signal maximum to 3,6 Volts. The clamp may be required to protect the 3,3 Volt controller logic.

1.1 Scope:

This document specifies items that are different than SCSI-3 SPI, it is not a complete parallel SCSI definition. Items not define in this document, SCSI-3 SPI rules apply.

2.0 TERMPWR Specification:

The JEDEC Standard for battery systems allows voltages from 3,0 Volts to 3,6 Volts. The very low voltage drop across fusing and unidirectional device shall be less than 0,2 Volts under the specified bus load conditions. The unidirectional device must withstand connection to 5 Volt SCSI devices, this allows SPI-LV products to connect to standard SCSI products. (Products are either targets or initiators.) An example of a Unidirectional device and fusing devices is an integrated electronic circuit breaker that does not have a body diode across the FET.

Not all controllers can provide adequate current for termination on both ends of the bus, for example the PCMCIA 32 bit standard only allows 1 Amp total for the PCMCIA card, this must be used for the logic on the card and power to the terminator on the card, it can not provide power to the terminator at the far end of the cable. Initiators that can not provide TERMPWR for the terminators shall use the SCSI symbols defined with a T covered by a circle with a slash. (See Annex A symbols.)

8 Bit data buses with 18 lines of termination shall supply a minimum current of 1 Amps.

16 Bit data buses with 27 lines of termination shall supply a minimum current of 1,5 Amps.

TERMPWR voltage at the source shall be 2,8 Volts to 5,25 Volts. TERMPWR voltage at the far end of the cable can be from 2,7 Volts to 5,25 Volts.

Single Ended TERMPWR	Minimum Voltage	Maximum Voltage	Minimum Current	Current Limit *
5,0 Volt System	4,25 Volts	5,25 Volts	1,5 Amps	2,0 Amps
3,3 Volt 8 data bit System	2,8 Volts	3,6 Volts	1,0 Amps	1,5 Amps
3,3 Volt 16 data bit System	2,8 Volts	3,6 Volts	1,5 Amps	2,0 Amps
Differential TERMPWR				
5,0 Volt System	4,0 Volts	5,25 Volts	1,0 Amps	2,0 Amps
3,3 Volt System	2,8 Volts	3,6 Volts	1,0 Amps	2,0 Amps

* Nominal Current Limit

3.0 Termination

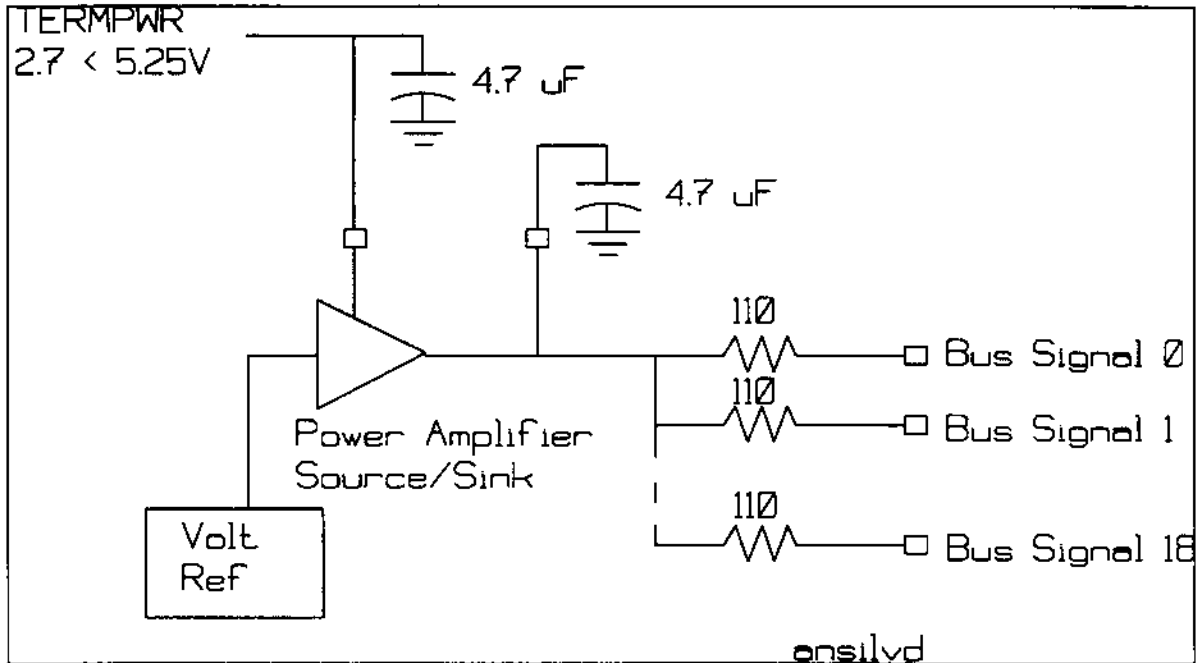
Regulated terminators shall be used to allow the terminators to perform the same over the full voltage range of 2,7 Volts to 5,25 Volts. The regulated terminators reduce the idle current reducing the power requirements.

Termination must pull the signal lines to 2,5 Volts, the TERMPWR voltage at the far end of the cable can drop to 2,7 Volts. A 0,2 Volt regulator drop out is required to meet the minimum TERMPWR voltage and the minimum pull up Voltage.

The maximum pull up current is 24 mA measured at 0,2 V d.c.

Note: Terminators shall meet all the requirements in SPI 7.1.1 over the 2,7 Volt to 5.25 Volt TERMPWR range.

Regulated terminators shall work with active negation drivers. The active negation drivers can drive the lines higher than the reference voltage, if a source only regulator is used the voltage can be pulled above. This can violate the maximum pull up current. Source/sink regulators, power amplifier designs shall be used.



4.0 Clamping

Controllers designed on 3.3 Volt processes may not be able to withstand 5.25 Volts. Active Negation drivers may drive the bus above 3.6 Volts. Bus signals may be clamped at 3.6 Volts to protect the controller. Clamping should only be used when the technology requires it, clamping is an impedance mismatch and may cause reflections.

Note: Drivers shall not driver more than 7 mA above 3.24 Volts SPI 7.1.2

Annex A Symbols

Symbol for Single-ended SCSI with 3.3 Volt source, and no TERMPWR for the far end. This is the standard symbol with 3.3 V added in the center for the lower source voltage. The T with the circle and slash means that TERMPWR is not available for the far end of the cable.

