X3T10/94-229R2 SPI-LP
SCSI-3 SPI Low Power

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

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1.0 Foreword:

A requirement has developed by low power applications, energy star/green power applications, Laptop and PCMCIA for a low power version of SCSI-3 SPI. This effects the TERMPWR voltage, termination, Signal when Termination is turned off, and powering down devices, it does not effect the thresholds.

Several of the issues can be used on other applications, not just the low power applications.

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 Termination Power Considerations

The single-ended SCSI bus is a traditional open collector style bus requires a lot power to the termination and drivers when the bus is driven. The passive termination requires a lot of power even when the bus is inactive. Terminator current requirements must be minimized.

2.1 Idle Bus Termination Current

The original 220/330 ohm passive termination can consume 181 mA on each end of the bus when the bus is free. **Passive termination shall not be used in low power applications**.

Termination that uses a combination of resistors and diode shall not be used. They normally violate SCSI-3 SPI and they require high idle current.

Regulated terminators draw very little current 1 < 30 mA at each end of the bus for existing regulated terminators when the bus is free. The newer versions of the terminators can be limited to 5 mA maximum for each end of the bus. Low idle current designs should be encouraged or required.

Terminators in disconnect mode should draw less than 5 μA. This will reduce the current load on the TERMPWR line. Low terminator disconnect current should be encouraged or required.

Regulated terminator power can be drastically reduced when the bus is not active by powering down the terminators. Drives should be spin down first then the termination powered down during inactivity periods and put into sleep mode. Laptops currently spin down drives during inactivity periods, the spin up time is considerably longer

2.2 Termination Operation Current - short cable applications
Battery operated systems are generally small systems that do not have heavy device loads or long cable lengths. Small systems do not need high pull up current.

Short buses do not need the normal pull up current to operate, 24 mA maximum at each end of the bus will allow 3 to 6 meter operation, less than 0,2 meters 1 mA pull up with 3 devices is less than 10 ns rise time, less than 0,3 meters 2 mA pull up is less than 10 ns.

2.3 Low Power Termination Restrictions

a.) SCSI Low Power shall use regulated terminators.
b.) Regulated terminator idle current shall be <5 mA for 18 lines and <7 mA for 27 lines for each end of the bus.
c.) Disconnect terminators shall be <15 μA per device.

3. Sleep mode
Protocol commands need to be added to direct devices to go into sleep mode. Sleep mode for the devices is an entry point to a full shut down of the SCSI bus, where the termination power and the bus controller will be powered down. Sleep mode the drives are spun down only a limited set of the bus logic is powered, all analog control circuitry is shutdown.

Sleep mode is very desirable for battery powered systems, energy star PC and workstations that are required to reduce power on long periods of in activity.

4.0 Powered Down Devices
Powered down devices shall not load the bus.

Powered down devices shall meet the maximum capacitance and input current specifications.

Annex A
(Informative)
Drive Spinning Considerations

Spinning down drives to conserve power must consider the life of the drive. Drives must be designed for the application with park and more start/stop life than normal. A basic design rule has been 1 power up cycle per day with a minimum of 3 year life powered on each day. Inactivity spin down can mean 100 drive spin ups a day as an average. The expect start/stop life of a drive should be included in the specifications.

The high spin up power compared to the run power must be carefully reviewed. Spinning down a drive may not conserve power if the drive is stopped for too short of a time. The spin up power and run power of a drive should be specified, this will allow designers to calculate minimum shutdown times that same power.