ULTRA SCSI SSWG

• SINCE THE LAST ULTRA SCSI SSWG MEETING THE FOLLOWING HAS BEEN ACCOMPLISHED:
  – MUCH BETTER HARDWARE FOR TESTING "ADVANCED" CONFIGURATIONS HAS BEEN ACQUIRED:
    » REAL SINGLE ENDED SCSI LOADS
    » SHORTER STUB EXTENSIONS
    » SOFTWARE FOR DISABLING ACTIVE NEGATION ON DATA LINES
    » 40 MEGATRANSFER/SEC DIFFERENTIAL TRANSCEIVERS
  – NEW DATA ACQUIRED:
    » SUCCESSFUL 40 MEGATRANSFER/SEC WITH SINGLE CHANNEL DIFFERENTIAL OVER 20 METERS (FIRST TRUE ULTRA-2 DATA)
    » FULLY LOADED ULTRA-1 SINGLE ENDED WORST CASE CONFIGURATIONS TESTED:
      • STUBS OF 1.3", 2.9", 4.9" AND 10.1" ON 4" CENTERS ON A 1.5 METER BUS
      • EFFECT OF ACTIVE NEGATION BRIEFLY EXPLORED

• A SET OF MINIMUM RECOMMENDATIONS FOR SINGLE ENDED IS NOW POSSIBLE
SINGLE ENDED ULTRA-1 SCSI

Transfer Error Rate Graph

1.5 Meters Total Length

14 Real SCSI Loads ~25pF
On 4" Centers
1.3" Stubs (Only That On Drive)

SCSI Data Only, Active Negation All Lines, 20 Megatransfers/Sec
4" Between Exciter and Comparator, Active Terminators
TI Single Ended Drivers/Receivers (3 Separate Chips)

Bill Ham  Digital Equipment March 31, 1994 Ultra SCSI SSWG
SINGLE ENDED SCSI -- 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
1.3" STUBS (ONLY THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES
4" BETWEEN EXCITER AND COMPARATOR
SINGLE ENDED SCSI -- 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
1.3" STUBS (ONLY THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES
4" BETWEEN EXCITER AND COMPARATOR

BILL HAM DIGITAL EQUIPMENT ULTRA SCSI WORKING GROUP MARCH 31, 1994
SINGLE ENDED SCSI -- 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
1.3" STUBS (ONLY THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES
4" BETWEEN EXCITER AND COMPARATOR
11 SINGLE ENDED DRIVERS/RECEIVERS (3 SEPARATE CHIPS)
4" BETWEEN EXCITER AND COMPARATOR ACTIVETERMINATORS
SCSI DATA ONLY, ACTIVE NEGATION ALL LINES; 20 MEGATRANSISTERS/SEC

14.9" STUBS (INCLUDING THAT ON DRIVE)
ON 4" CENTERS
14 REAL SCSI LOADS ~26pf

1.5 METERS TOTAL LENGTH

Time (ns)
SINGLE ENDED SCSI – 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
2.9" STUBS (INCLUDING THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES
4" BETWEEN EXCITER AND COMPARATOR

BILL HAM  DIGITAL EQUIPMENT  ULTRA SCSI WORKING GROUP  MARCH 31, 1994
SINGLE ENDED SCSI -- 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
2.9" STUBS (INCLUDING THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES
4" BETWEEN EXCITER AND COMPARATOR
SINGLE ENDED SCSI – 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

16 REAL SCSI LOADS ~25pF
ON 4” CENTERS
2.9” STUBS (INCLUDING THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES
4” BETWEEN EXCITER AND COMPARATOR

DRIVER INPUT

RECIEVER OUTPUT

BILL HAM DIGITAL EQUIPMENT ULTRA SCSI WORKING GROUP MARCH 31, 1994
SINGLE ENDED ULTRA-1 SCSI

Transfer Error Rate Graph

1.5 METERS TOTAL LENGTH

16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
4.9" STUBS (INCLUDING THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES, 20 MEGATRANSFERS/SEC
4" BETWEEN EXCITER AND COMPARATOR, ACTIVE TERMINATORS
TI SINGLE ENDED DRIVERS/RECEIVERS (3 SEPARATE CHIPS)

BILL HAM  DIGITAL EQUIPMENT  MARCH 31, 1994  ULTRA SCSI SSWG
SINGLE ENDED SCSI -- 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

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16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
4.9" STUBS (INCLUDING THAT ON DRIVE)

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4" BETWEEN EXCITER AND COMPARATOR
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BILL HAM DIGITAL EQUIPMENT ULTRA SCSI WORKING GROUP MARCH 31, 1994
SINGLE ENDED SCSI -- 20 MEGATRANSFERS/SEC

1.5 METERS TOTAL LENGTH

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SCSI DATA ONLY, ACTIVE NEGATION ALL LINES
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SINGLE ENDED ULTRA-1 SCSI

Transfer Error Rate Graph

1.5 METERS TOTAL LENGTH

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16 REAL SCSI LOADS ~25pF
ON 4" CENTERS
10.1" STUBS (INCLUDING THAT ON DRIVE)

SCSI DATA ONLY, ACTIVE NEGATION ALL LINES, 20 MEGATRANSFERS/SEC
4" BETWEEN EXCITER AND COMPARATOR, ACTIVE TERMINATORS
TI SINGLE ENDED DRIVERS/RECEIVERS (3 SEPARATE CHIPS)

BILL HAM  DIGITAL EQUIPMENT  MARCH 31, 1994  ULTRA SCSI SSWG
SINGLE ENDED SCSI -- 20 MEGATRANSFERS/SEC

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4" BETWEEN EXCITER AND COMPARATOR

BILL HAM DIGITAL EQUIPMENT ULTRA SCSI WORKING GROUP MARCH 31, 1994
PRELIMINARY RECOMMENDATIONS FOR SINGLE ENDED ULTRA-1 SCSI RULES:

- BUS LENGTH LIMITED TO 1.5 METERS
- ACTIVE NEGATION REQUIRED FOR REQ, ACK, DATA, AND PARITY LINES
- SPI RULES FOR CABLE WIRING MUST BE FOLLOWED
- STUBS SPACING OF 4" MIN WITH 4" MAX STUB LENGTH
- DEVICE CAPACITANCE LIMITED TO 25 PF
- POSITION CLOCK (REQ, ACK) TO FAVOR SETUP TIME BY 5 NANOSECONDS
- MAXIMUM SLEW TIME 8 NANOSECONDS MINIMUM 4 NANOSECONDS
- RESTRICT RECEIVER THRESHOLD RANGE AS MUCH AS POSSIBLE – AVOID LOW VOLTAGE THRESHOLDS – BEST SEEMS TO BE AROUND 1.4 VOLTS

\[
\text{Rise Time} = \frac{15 \text{ns}}{2.5 \text{V}}
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\[
\text{Worst Case Load} = 15 \text{ns} / 2.5 \text{V}
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BILL HAM  DIGITAL EQUIPMENT  MARCH 31, 1994  ULTRA SCSI SSWG